AD-A055 512 FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER FP--ETC F/G 4/2

ANNUAL TYPHOON REPORT 1977.(U)

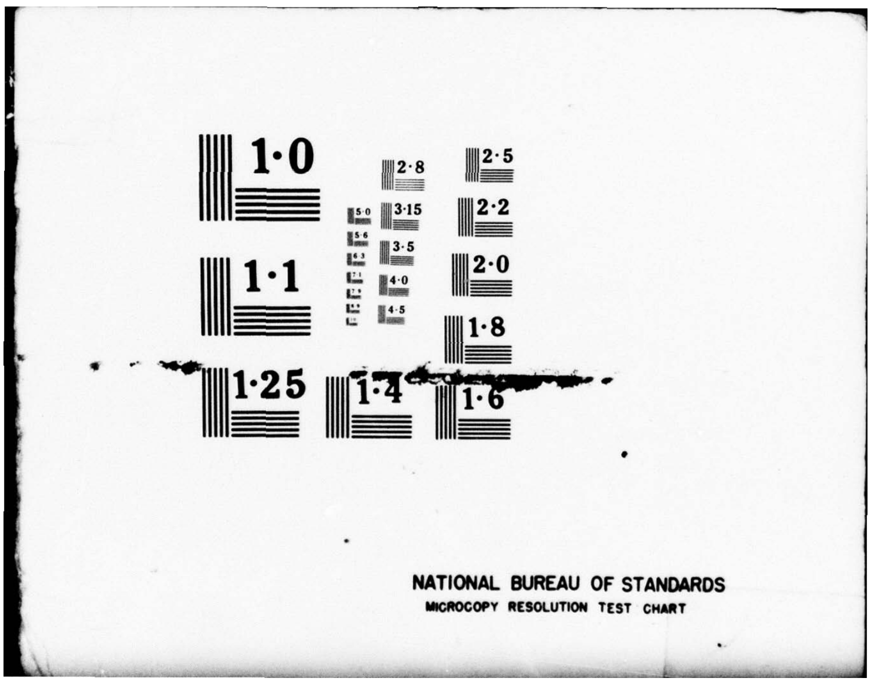
1977 D R MORFORD, J K LAVIN

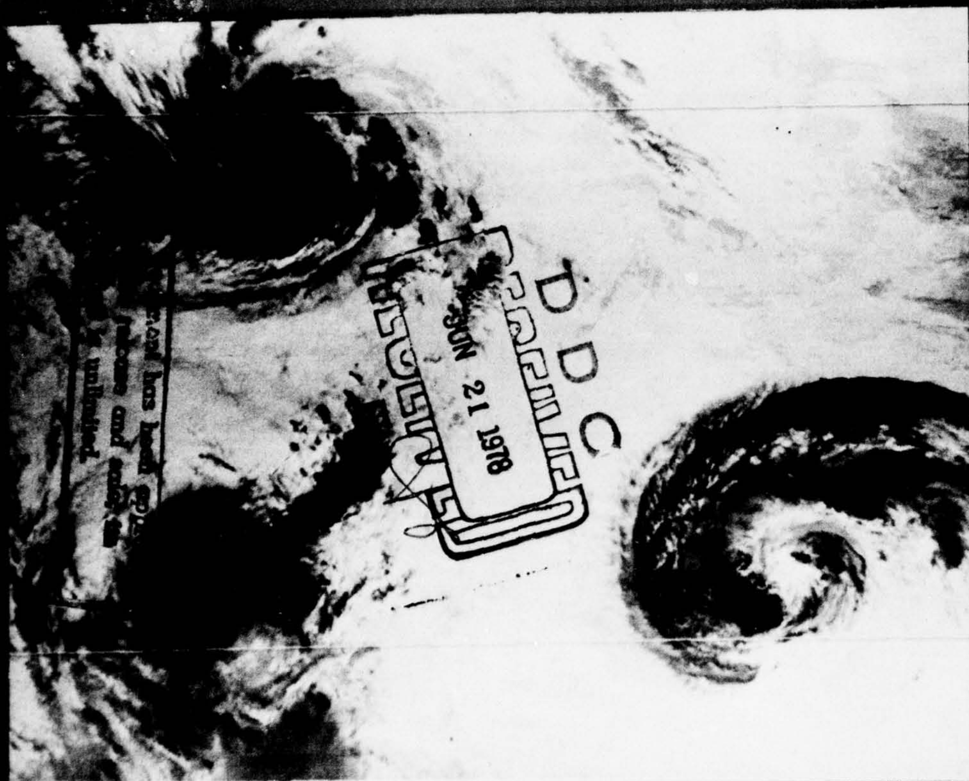
UNCLASSIFIED NL

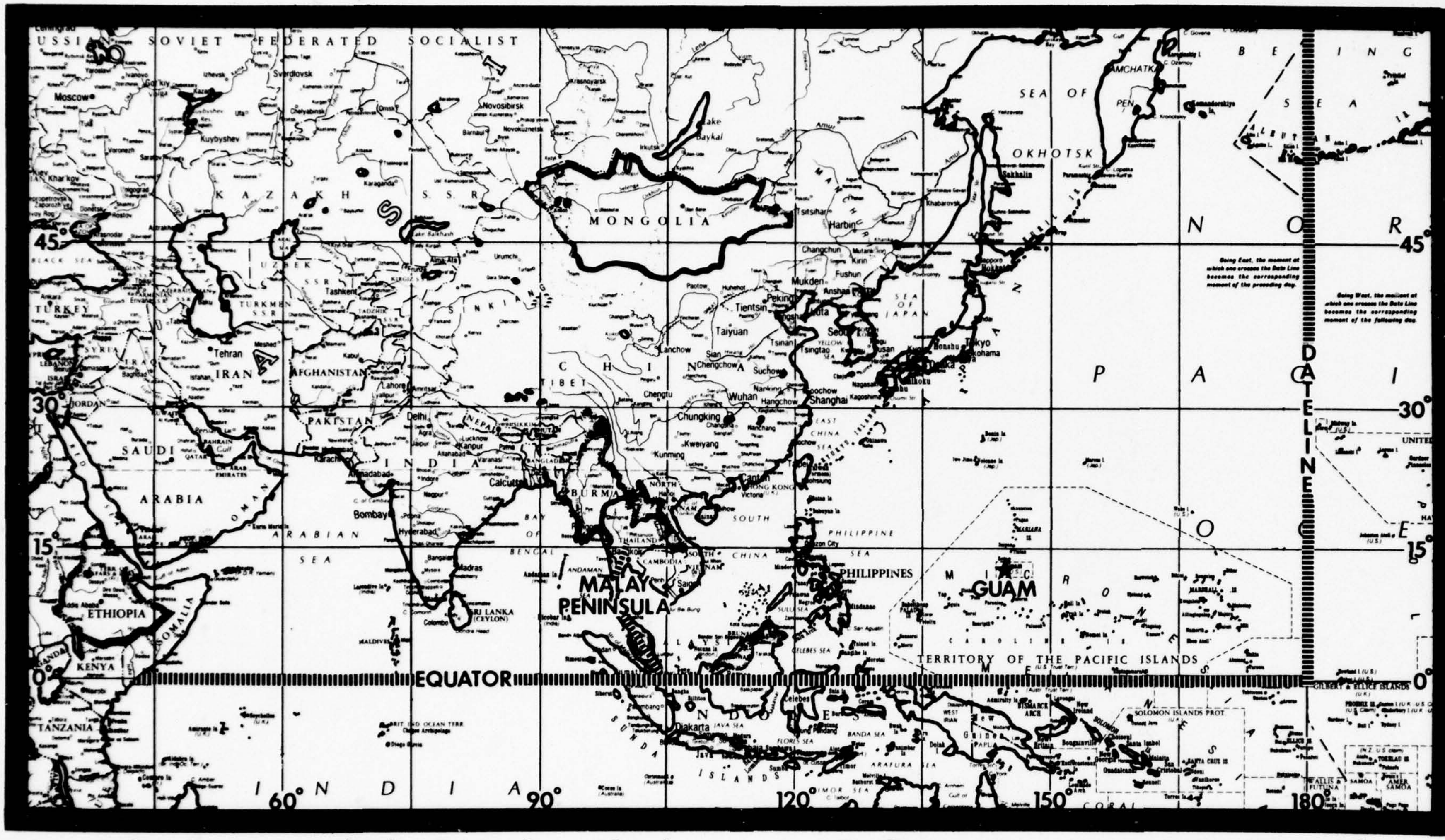
1 OF 2

ADA

055512


1·0
2·8
2·5
3·15
2·2
5·0
5·6
3·5
6·3
2·0
1·1
4·0
4·5
1·8
1·25
1·4
1·6
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART


DDC
JUN 21 1978



Indian Ocean Area (Malay Peninsula to Africa)

Pacific Area (Dateline to Malay Peninsula)

AREA OF RESPONSIBILITY - JOINT TYPHOON WARNING CENTER, GUAM

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DDC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

U. S. FLEET WEATHER CENTRAL
JOINT TYPHOON WARNING CENTER
COMNAVMARIANAS BOX 17
FPO SAN FRANCISCO 96630

12

DEAN R. MORFORD
Captain, United States Navy

COMMANDING

JAMES K. LAVIN
Lieutenant Colonel, United States Air Force

DIRECTOR, JOINT TYPHOON WARNING CENTER

STAFF

LCDR David Sokol, USN
LCDR Carl B. Ihli, Jr., USN
LT Gary R. Willms, USN
*LT George T. McKaige, USN
*CAPT Frederick P. Milwer, USAF
CAPT Alan W. Hassebrock, USAF
CAPT Charles P. Guard, USAF
CAPT John D. Shewchuk, USAF
ENS Edward M. Fukada, USNR
MSGT Hans J. Hassl, USAF
*SSGT Ellis D. Spencer, USAF
SSGT Bobby L. Setliff, USAF
*AG2 Greg P. Metzger, USN
*AG2 Robert L. Hern, Jr., USN
*AG2 Susan J. Funk, USN
AG2 Andree S. Webster, USN
SGT Paul D. Edwards, USAF
*AG3 Deirdre A. Wexler, USN
*SRA Craig A. Anderson, USAF
SRA Vandora A. Barnes, USAF
AGAN Kenneth A. Kellogg, USN
AGAN John A. Kilburn, USN
AGAN Karen F. Moorefield, USN
Ms. Marcelina L. G. Aguon, Secretary

CONTRIBUTOR

Det 1, 1WW - USAF

1977
ANNUAL TYPHOON REPORT

*Departed during 1977 season

FRONT COVER:

Infrared photograph of a two-storm situation with a third during its early stages of development, 19 September 1977. Typhoon Dinah (lower left) at 65 kt (33 m/sec) is meandering in the South China Sea. Details of Dinah can be found on page 30. Tropical Storm Emma (upper right) with 45 kt (23 m/sec) winds is undergoing recurvature southeast of Japan. A yet unnumbered tropical disturbance (which will eventually become Tropical Storm Freda) is slowly developing in the Philippine Sea (lower right). (Direct readout NOAA-5 VHRR IR imagery as received by Det 1, 1WW Nimitz Hill, Guam.)

FOREWORD

Tropical cyclones have always been a menace to both military and civilian activities in tropical and subtropical oceanic regions. During recent times, much effort has been funneled toward more accurate tropical cyclone forecasts and toward more efficient operational responses to those forecasts. A large portion of this effort is based on studies which, if meaningful, must be based on accurately documented data. The Annual Typhoon Report represents such documentation. The body of this report is a summary of the tropical cyclones that occurred during 1977 in the western North Pacific, central North Pacific and North Indian Oceans.

The Annual Typhoon Report is prepared by the staff of the Joint Typhoon Warning Center (JTWC). JTWC is a combined USAF/USN entity operating under the command of Fleet Weather Central, Guam. The senior Air Force officer assigned is designated as Director, JTWC and is responsible to the Commanding Officer, Fleet Weather Central, Guam for the operation of the JTWC. The senior Naval officer of the JTWC is designated as the Deputy Director/Operations Officer. JTWC was established by CINCPACFLT message 280208Z April 1959 when directed by CINCPAC message 230233Z April 1959. Its operation is guided by the CINCPAC INST 3140.1 (series).

The Fleet Weather Central/Joint Typhoon Warning Center, Guam has the responsibility to:

1. Provide continuous meteorological watch of all tropical activity north of the equator, west of the Date Line, and east of the African coast (JTWC area of responsibility) for potential tropical cyclone development;

2. Provide warnings for all tropical cyclones in the assigned area of responsibility;

3. Determine tropical cyclone reconnaissance requirements and assign priorities;

4. Conduct an annual post analysis of all tropical cyclones occurring within the area north of the equator from 140W west to the coast of Africa and prepare an Annual Typhoon Report for issuance to interested agencies; and

5. Conduct tropical cyclone forecasting and detection research as practicable.

In the event of incapacitation of the JTWC, the alternate (AJTWC) assumes the responsibility for the issuance of warnings. In early November, 1977, Fleet Weather Central, Pearl Harbor, Hawaii was designated as the AJTWC. Assistance in determining tropical cyclone reconnaissance requirements and in obtaining reconnaissance data is provided by Detachment 4, 1st Weather Wing, Hickam AFB, Hawaii. Previously, the AJTWC designate was Detachment 17, 30WS, Yokota AB, Japan, with assistance from the Naval Weather Service Facility, Yokosuka, Japan.

The Central Pacific Hurricane Center, (CPHC) Honolulu, Hawaii is manned by members of the U. S. National Weather Service who are responsible for the issuance of tropical cyclone warnings for the area north of the equator from the Date Line east to 140W. Warnings are issued in coordination with the Fleet Weather Central, Pearl Harbor and Detachment 4, 1WW, Hickam AFB, Hawaii. Post analysis information is forwarded to the JTWC for inclusion in the Annual Typhoon Report.

The meteorological services of the United States are planning to implement the metric system of measurement over the next few years. Some civilian and military agencies have started the education program by showing the metric equivalents to current units of measure. This Annual Typhoon Report includes metric equivalents to most measures.

Unless otherwise stated all satellite data used in this ATR is Air Force Weather Service DMSP Data as acquired by OL-C, 27CS personnel and analyzed by Det 1, 1WW personnel colocated with JTWC at Nimitz Hill, Guam.

TABLE OF CONTENTS

		page
CHAPTER I	OPERATIONAL PROCEDURES	
	1. General	1
	2. Data Sources	1
	3. Analyses	1
	4. Forecast Aids	1
	5. Forecasting Procedures	2
	6. Warnings	2
	7. Prognostic Reasoning Message	2
	8. Significant Tropical Weather Advisory	3
	9. Tropical Cyclone Formation Alert	3
CHAPTER II	RECONNAISSANCE AND COMMUNICATIONS	
	1. General	4
	2. Reconnaissance	4
	3. Aircraft Reconnaissance Evaluation Criteria	4
	4. Aircraft Reconnaissance Summary	5
	5. Satellite Reconnaissance Summary	5
	6. Radar Reconnaissance Summary	6
	7. Communications	7
CHAPTER III	RESEARCH SUMMARY	
	1. General	8
	2. Operational Application of a Tropical Cyclone Recurvature/Non-Recurvature Study Based on 200 MB Wind Fields	8
	3. Tropical Cyclone Center Fix Data for the 1976 Storm Season	8
	4. Evaluation of the Dvorak IR Technique for Use With DMSP Data	8
	5. A Climatology of Tropical Cyclones for the Period 1971-1976	8
	6. Relationships Between the Temporal Variation of Equivalent Potential Temperature and Tropical Cyclone Intensity	8
	7. Transitioning of Tropical Cyclones to Extratropical Cyclones	8
	8. Future Aircraft Reconnaissance Storm Tracks	8
	9. Tropical Chart Series for September 1975	9
	10. Tropical Weather Study Guide	9
CHAPTER IV	SUMMARY OF TROPICAL CYCLONES	
	1. Western North Pacific Tropical Cyclones	10

Individual Typhoons

	page		page
Typhoon Sarah	19	Typhoon Ivy	35
Typhoon Thelma	21	Typhoon Jean	38
Typhoon Vera	23	Typhoon Kim	41
Typhoon Babe	27	Typhoon Lucy	45
Typhoon Dinah	30	Typhoon Mary	48
Typhoon Gilda	33		

2. North Indian Ocean Tropical Cyclones ---------- 51

Individual Cyclone

	page
TC 22-77	53

3. Central North Pacific Tropical Cyclones ---------- 55

CHAPTER V	SUMMARY OF FORECAST VERIFICATION DATA	
	1. Annual Forecast Verification	56
	2. Comparison of Objective Techniques	59
	3. Evaluation of the Tropical Cyclone Model (TCM)	62
	4. Pacific Area Tropical Storm and Depression Data	64
	5. Pacific Area Typhoon Data	69
	6. Indian Ocean Area Cyclone Data	77

			page
CHAPTER VI	TROPICAL CYCLONE CENTER FIX DATA		
	1.	Introduction	79
	2.	Format	80
	3.	Western North Pacific Fix Data	82
	4.	North Indian Ocean Fix Data	115
APPENDIX	CONTRACTIONS AND DEFINITIONS		
	1.	Contractions	121
	2.	Definitions	122
DISTRIBUTION			123

CHAPTER I — OPERATIONAL PROCEDURES

1. GENERAL

Routine services provided by the Joint Typhoon Warning Center (JTWC) include the following: (1) Significant Tropical Weather Advisories issued daily describing all tropical disturbances and their potential for further development; (2) Tropical Cyclone Formation Alerts issued whenever interpretation of satellite and synoptic data indicates likely formation of a significant tropical cyclone; (3) Tropical Cyclone Warnings issued four times daily whenever a significant tropical cyclone exists in the Pacific area; (4) Tropical Cyclone Warnings issued twice daily whenever a significant tropical cyclone exists in the Indian Ocean area; and (5) Prognostic Reasoning messages issued twice daily for tropical storms and typhoons in the Pacific area.

JTWC responds to changing requirements of activities serviced. Therefore, contents of routine services are subject to change from year to year usually as a result of the Annual Tropical Cyclone Conference deliberations.

2. DATA SOURCES

a. COMPUTER PRODUCTS:

FLEWEACEN Guam provides computerized meteorological/oceanographic products for JTWC. In addition, the standard array of synoptic-scale computer analyses and prognostic charts are available from the Fleet Numerical Weather Central (FNWC) at Monterey, California via FLEWEACEN Guam.

b. CONVENTIONAL DATA:

Conventional meteorological data are defined as surface and upper air observations from island, ship and land stations plus weather observations from commercial and military aircraft (AIREPS). Computer plotted charts of 0000Z and 1200Z conventional data are produced daily for the surface, 850 mb, 700 mb, and 500 mb levels. A chart of upper air data is produced which utilizes 200 mb rawinsonde data and AIREPS above 29,000 ft within 6 hours of the 0000Z and 1200Z synoptic times. The surface/gradient, 500 mb and 200 mb level charts are hand plotted over important tropical/subtropical regions during the tropical cyclone season to complement computer aids and insure all available data are used.

c. AIRCRAFT RECONNAISSANCE:

Aircraft weather reconnaissance data are invaluable in the positioning of centers of developing systems and essential for the accurate determination of the eye/center, maximum intensity, minimum sea-level pressure, and radius of significant winds exhibited by tropical cyclones. These data are plotted on large-scale sectional charts for each mission flown. A comprehensive discussion of aircraft weather reconnaissance is presented in Chapter II.

d. SATELLITE RECONNAISSANCE:

Meteorological satellite data from the Defense Meteorological Satellite Program (DMSP) and the National Oceanic and Atmospheric Administration played a major role in the early detection and tracking of tropical cyclones in 1977. A discussion of this role, as well as applications of satellite data to tropical cyclone analysis and forecasting, is presented in Chapter II.

e. RADAR RECONNAISSANCE:

During 1977, as in recent years, land radar coverage was utilized extensively when available. Once a storm moved within the range of a land radar site, reports were usually received hourly. Use of radar during 1977 is discussed in Chapter II.

3. ANALYSIS

A composite surface/gradient level (3000 ft) manual analysis is accomplished on the 0000Z and 1200Z conventional data. Analysis of the wind field using streamlines is stressed for tropical and subtropical regions. Analysis of the pressure field is stressed for higher latitudes and vicinity of intense tropical systems.

Manual analysis of the 500 mb level is accomplished on the 0000Z and 1200Z data when significant tropical cyclones exist. Although the analysis of the 500 mb height field is stressed, analysis of the wind field to more clearly delineate steering currents is equally important.

A composite upper-tropospheric, manual analysis, utilizing rawinsonde data from 300 mb through 100 mb, wind directions extracted from satellite data by Det 1, 1WW and AIREPS (plus or minus 6 hours) at or above 29,000 feet is accomplished on 0000Z and 1200Z data daily. Wind and height data are used to arrive at a representative analysis of tropical cyclone outflow patterns, of steering currents, and of areas that may indicate tropical cyclone intensity change.

Additional sectional charts at intermediate synoptic times and auxiliary charts such as checkerboard diagrams and pressure change charts are also analyzed during periods of significant tropical cyclone activity.

4. FORECAST AIDS

a. CLIMATOLOGY:

Climatological publications utilized during the 1977 typhoon season include previous JTWC Annual Typhoon Reports and climatic publications from Fleet Weather Central, Guam, Director Naval Oceanography and Meteorology, Naval Weather Research Facility, Naval Environmental Prediction Research Facility, Naval Postgraduate School, Air Weather Service, First Weather Wing and Chanute Technical

Training Center, plus publications from other Air Force and Navy activities, various universities and foreign countries.

b. OBJECTIVE TECHNIQUES:

The following objective techniques were employed in tropical cyclone forecasting during 1977. A description and an evaluation of these techniques is presented in Chapter V:

(1) TYFN75
(2) MOHATT 700/500
(3) FCSTINT
(4) 12-HR EXTRAPOLATION
(5) HPAC
(6) TROPICAL CYCLONE MODEL
(7) INJAH74

5. FORECASTING PROCEDURES

a. INITIALIZATION:

In the preparation of each warning, the actual surface location (fix) of the tropical cyclone eye/center just prior to (within three hours of) warning time is of prime importance. JTWC uses the Selective Reconnaissance Program (SRP) to levy an optimum mix of aircraft, satellite and radar resources to obtain fix information. When tropical cyclones are either poorly defined or the actual surface location can not be determined but an upper level position is available, or when conflicting fix information is received, the "best estimate" of the surface location is subjectively determined from the analysis of all available data. If fix data is not available due to reconnaissance platform malfunctions or communication problems, synoptic data or extrapolation from previous fixes is used. The initial forecast (warning time) position is then obtained by extrapolation using the current fix and a "best track" of the cyclone movement to date.

b. TRACK FORECASTING:

An initial forecast track is developed based on persistence, climatology and objective techniques. This initial track is subjectively modified based on the following:

(1) The prospects for recurvature are evaluated for all westward and northward moving storms. This evaluation is based primarily on present and forecast position and amplitude of middle tropospheric mid-latitude troughs from the latest 500 mb analysis and numerical prognoses.

(2) Determination of steering level is partly influenced by maturity and vertical extent of the system. For mature storms located south of the 500 mb subtropical ridge, forecast changes in speed of movement are closely correlated with forecast changes in the intensity of the ridge. When steering currents are very weak, the tendency for storms to move northward due to their internal forces is an important consideration.

(3) Over the 12- to 72-hr forecast spectrum, speed of movement during the early time frame is biased toward persistence (12 hr extrapolation) while that near the end of the time frame is biased towards objective techniques and climatology.

(4) A final check is made against climatology to ascertain the likelihood of the forecast track. If the forecast deviates greatly from climatology, the forecast rationale is reappraised and the track adjusted as necessary.

c. INTENSITY FORECASTING:

In forecasting intensity, heavy reliance is placed on aircraft reconnaissance reports, the Dvorak satellite interpretation model, and the objective techniques. Additional considerations are the position and intensity of the tropical upper-tropospheric trough, extent and intensity of upper-level outflow, sea surface temperature, terrain influences, speed of movement, and proximity to an extratropical environment.

6. WARNINGS

Tropical cyclone warnings are numbered sequentially. If warnings are discontinued and the storm reintensifies, warnings are numbered consecutively from the last warning issued. Amended or corrected warnings are given the same number as the warnings they modify plus a sequential alphabetical designator. Each warning includes the initial warning time eye/center position, intensity, and the radial extent of 30, 50 and 100 kt surface winds (when applicable); the latest fix position used; the 12 hr forecast direction and speed of movement; and, forecast information. Warnings within the JTWC Pacific Area are issued within two hours of 0000Z, 0600Z, 1200Z and 1800Z with the constraint that two consecutive warnings may not be more than seven hours apart. This variable warning time allows for maximum use of all available reconnaissance platforms and spreads the workload in multiple storm situations. The forecast intervals for all tropical cyclones, regardless of intensity, are 12-, 24-, 48- and 72-hr.

Warnings in the JTWC Indian Ocean area are issued within two hours of 0800Z and 2000Z with the constraint that two consecutive warnings may not be more than fourteen hours apart. Warnings for this area are issued only after a tropical cyclone has attained an intensity of 34 kt or greater. Forecast intervals are 24 and 48 hours.

Warning forecast positions are verified against the corresponding post analysis "best track" positions. A summary of the verification results for 1977 is presented in Chapter V.

7. PROGNOSTIC REASONING MESSAGE

In the Pacific Area, prognostic reasoning messages are transmitted based on the 0000Z and 1200Z warnings or whenever the previous reasoning is no longer valid. This plain language message is intended to provide field meteorologists with the reasoning behind the latest JTWC forecast. Prognostic reasoning messages are not prepared for tropical depressions nor for the Indian Ocean area.

This season JTWC began including confidence statements for the 24 hr forecasts. A summary of the verification results is presented in Chapter V.

Prognostic reasoning information applicable to all customers is provided in the remarks section of warnings when significant changes are made or when deemed appropriate by the typhoon duty officer.

8. SIGNIFICANT TROPICAL WEATHER ADVISORY

This plain language message, summarizing significant weather in the entire JTWC area of responsibility, is issued by 0600Z daily. It contains a detailed, non-technical description of all significant tropical disturbances and the JTWC evaluation of potential for significant tropical cyclone development within the 24 hr forecast period.

9. TROPICAL CYCLONE FORMATION ALERT

Alerts are issued whenever interpretation of satellite and other meteorological data indicates significant tropical cyclone formation is likely. These alerts will specify a valid period not to exceed 24 hours and must either be cancelled, reissued or superseded by a warning prior to expiration of the valid period.

CHAPTER II – RECONNAISSANCE & COMMUNICATIONS

1. GENERAL

The Joint Typhoon Warning Center depends on reconnaissance to provide necessary, accurate and timely meteorological information in support of each warning. The JTWC relies primarily on three sources of reconnaissance: aircraft, satellite and radar. Optimum utilization of all available reconnaissance assets is obtained through use of the Selective Reconnaissance Program (SRP) whereby various factors are considered in selecting a specific reconnaissance platform for each warning. Factors include: the cyclone's location and intensity, reconnaissance platform availability, current operations, limitation of reconnaissance assets, and the cyclone's threat to life/property. A listing of reconnaissance fixes used this season can be found in Chapter VI. Timely receipt of reconnaissance data is extremely important to the typhoon warning service. Similarly, a warning is useless unless it can be received by customers in a timely fashion. Therefore, efficient communications into and out of JTWC is invaluable.

2. RECONNAISSANCE

a. AIRCRAFT:

Aircraft weather reconnaissance is performed in the JTWC area of responsibility by the 54th Weather Reconnaissance Squadron (54 WRS). The squadron, presently equipped with six WC-130 aircraft, is located at Andersen Air Force Base, Guam. From July through October, augmentation by the 53rd Weather Reconnaissance Squadron at Keesler Air Force Base, Mississippi brings the total number of available aircraft to nine. The JTWC reconnaissance requirements are provided daily throughout the year to the Tropical Cyclone Aircraft Reconnaissance Coordinator (TCARC). These requirements include area(s) to be investigated,tropical cyclone(s) to be fixed, fix times, and forecast position of fix. In accordance with CINCPACINST 3140.1M, "Usage of reconnaissance assets in acquiring meteorological data from aircraft, satellites and land-based radar shall be at the discretion of FLEWEACEN/JTWC Guam based on the following priorities:

(1) Alert flights and vortex or center fixes as required for issuance of tropical cyclone warnings in the Pacific area of responsibility;

(2) Center or vortex fixes as required for issuance of tropical cyclone warnings in the Indian Ocean area of responsibility;

(3) Supplementary fixes; and

(4) Synoptic data acquisition".

As in previous years, aircraft reconnaissance provided direct measurements of height, temperature, flight level winds, sea level pressure, estimated surface winds (when observable) and numerous additional parameters. The meteorological data is gathered by the Aerial Weather Reconnaissance Officers and dropsonde operators of Detachment 4, Hq AWS who crew with the 54th. These data provide the Typhoon Duty Officer indications of changing cyclone characteristics, radius of cyclone associated winds and position and intensity determinations. Another important aspect of this data is its availability for research in tropical cyclone analysis and forecasting. Aircraft reconnaissance will become even more important in years to come when high-resolution tropical cyclone dynamic steering programs will require a dense input of wind and temperature data.

b. SATELLITE

Satellite fixes from USAF ground sites and USN ships provide day and night coverage in the JTWC area of responsibility. Interpretation of this satellite imagery provides cyclone positions, and for daytime passes estimates of storm intensities are also made through the Dvorak technique.

Detachment 1, 1st Weather Wing on Guam is the primary fix site for the western North Pacific. Both DMSP and NOAA data are received and processed. DMSP fix positions received at JTWC from the Air Force Global Weather Central (AFGWC), Offutt Air Force Base, Nebraska were the major source of satellite data for the Indian Ocean. NOAA satellite fixes were also received from Fleet Weather Facility (FLEWEAFAC), Suitland, Maryland for the western Pacific and Indian Ocean areas. GOES fixes were also provided by the National Environmental Satellite Service, Honolulu, Hawaii for the storms near the dateline.

c. RADAR

Land radar also provides very useful positioning data on well developed cyclones when in proximity (usually within 175 nm of the radar site) of the Republic of the Philippines, the Republic of China, Hong Kong, Japan (including the Ryukyu Islands), the Republic of Korea, and Guam.

3. AIRCRAFT RECONNAISSANCE EVALUATION CRITERIA

The following criteria are used to evaluate reconnaissance support to JTWC.

a. Six-hour fixes - To be counted as made on time, a fix must satisfy the following criteria:

(1) Fix must be made not earlier than 1 hr before, nor later than 1/2 hr after scheduled fix time.

(2) Aircraft in area requested by scheduled fix time, but unable to locate center due to:

(a) Cyclone dissipation; or

(b) Rapid acceleration of the cyclone away from the forecast position.

(3) If penetration not possible due to geographic or other flight restrictions, aircraft radar fixes are acceptable.

b. Levied 6-hr fixes made outside the above limits are evaluated as follows:

(1) Early-fix is made within the interval from 3 hr to 1 hr prior to scheduled fix times. However, no credit will be given for early fixes made within 3 hr of the previous fix.

(2) Late-fix is made within the interval from 1/2 hr to 3 hr after scheduled fix time.

c. When 3 hr fixes are levied, they must satisfy the same time criteria discussed above in order to be classified as made on time. Three-hour fixes made that do not meet the above criteria are classified as follows:

(1) Early-fix is made within the interval from 1 1/2 hr to 1 hr prior to schedule fix time.

(2) Late-fix is made within the interval from 1/2 hr to 1 1/2 hr after schedule fix time.

d. Fixes not meeting the above criteria are scored as missed.

e. Fixes levied as "resources permitting" are not evaluated.

f. Investigatives - to be counted as made on time, investigatives must satisfy the following criteria:

(1) The aircraft must be within 250 nm of the specified point by the scheduled time.

(2) The specified flight level and track must be flown.

(3) Reconnaissance observations are required every half-hour in accordance with AWSM 105-1. Turn and mid-point winds shall be reported on each full observation within 250 nm of the levied point.

(4) Observations are required in all quadrants unless a concentrated investigation in one or more quadrants has been specified.

(5) Aircraft must contact JTWC before leaving area of concern.

g. Investigatives not meeting the time criteria of paragraph f, will be classified as follows:

(1) Late-aircraft is within 250 nm of the specified point after the scheduled time, but prior to the scheduled time plus 2 hr.

(2) Missed-aircraft fails to be within 250 nm of the specified point by the scheduled time plus 2 hr.

4. AIRCRAFT RECONNAISSANCE SUMMARY

During the 1977 tropical cyclone season, 199 six-hourly vortex fixes and 4 supplementary vortex fixes were levied (Table 2-1). This was 114 less than during 1976. There were fewer tropical cyclones (4) and 169 fewer warnings issued. Increased reliance on satellite data as a fix platform and utilization of aircraft for synoptic data accounted for the lower percentage of aircraft fixes. For example in 1976, 310 aircraft fixes were levied for 661 warnings (46.9%) while in 1977 only 203 fixes were levied for 494 warnings (41.1%). In addition to vortex fixes, 42 investigative missions were levied during 1977 compared with 34 in 1976. Various factors accounted for the increase. In 1977 only 3 storms had no investigatives because of distances involved while 11 storms had 2 or more and 7 investigatives were levied on systems that did not develop. In 1976 7 storms had no investigatives with only 2 storms having 2 investigatives each.

Reconnaissance effectiveness is summarized in Table 2-1. The missed fix rate of 1.5% is the best in recent years.

TABLE 2-1. AIRCRAFT RECONNAISSANCE EFFECTIVENESS

EFFECTIVENESS	NUMBER OF FIXES	PERCENT
COMPLETED ON TIME	189	93.1
EARLY	0	0.0
LATE	11	5.4
MISSED	3	1.5
TOTAL	203	100.0

LEVIED VS. MISSED FIXES

	LEVIED	MISSED	PERCENT
AVERAGE 1965-1970	507	10	2.0
1971	802	61	7.6
1972	624	126	20.2
1973	227	13	5.7
1974	358	30	8.4
1975	217	7	3.2
1976	317	11	3.5
1977	203	3	1.5

5. SATELLITE RECONNAISSANCE SUMMARY

The Air Force provides satellite reconnaissance support to JTWC using meteorological data from polar orbiting meteorological satellites of the Defense Meteorological Satellite Program (DMSP).

A network of tactical DMSP sites at Nimitz Hill, Guam; Clark AB, Philippines; Kadena AB, Japan; Osan AB, Korea; and Hickam AFB, Hawaii provides direct readout coverage north of the equator from the dateline west

into the South China Sea. In February 1977, the Guam site was modified to acquire very high resolution data from the National Oceanic and Atmospheric Administration (NOAA) satellites. The Hawaii site was modified soon after.

The Air Force Global Weather Central (AFGWC) at Offutt AFB, Nebraska using stored data readout provides satellite reconnaissance over the Indian Ocean and backup for the tactical sites in WESTPAC. Det 1, 1WW at Guam, colocated with JTWC, operates the network, tasking appropriate sites for tropical cyclone position reports.

Prior to October 1977, both the technicians who maintain and operate the DMSP ground station equipment and the analysts who interpret the data were members of Air Weather Service (AWS). In October 1977, the technicians became members of the Air Force Communications Service (AFCS) as part of an overall AWS/AFCS maintenance consolidation.

Satellite positions are assigned Position Code Numbers (PCN's) depending on the availability of geography for precise gridding and the state of the tropical cyclone's circulation. These are shown in Table 2-2. Estimates of tropical cyclone intensity are obtained from visual data using the Dvorak technique (NOAA Technical Memorandum NESS 45 and later refinements).

TABLE 2-2. POSITION CODE NUMBERS

PCN	METHOD OF CENTER DETERMINATION/GRIDDING
1	EYE/GEOGRAPHY
2	EYE/EPHEMERIS
3	WELL DEFINED CC/GEOGRAPHY
4	WELL DEFINED CC/EPHEMERIS
5	POORLY DEFINED CC/GEOGRAPHY
6	POORLY DEFINED CC/EPHEMERIS

CC=Circulation Center

Increased satellite availability provided the opportunity to more effectively use satellite reconnaissance through the Selective Reconnaissance Program (SRP). For the first time more than half of JTWC's warnings in WESTPAC (51%) were based on satellite positions of tropical cyclones. In the Indian Ocean, where aircraft and radar were not available, 95.5% of JTWC's warnings were based on satellite fixes.

Use of a dual-site tasking concept which requires at least two DMSP sites to make each JTWC levied tropical cyclone fix has in the past resulted in a 99% reliability in meeting JTWC's satellite fix requirements. However in 1977, this reliability dropped to 94.9% due to an unreliable early afternoon and early morning DMSP satellite.

The loss of data from this satellite was random. Therefore, aircraft reconnaissance was levied to support the 0600Z and 1800Z warnings when appropriate. Radar and NOAA 5 satellite data was also used as primary or backup reconnaissance at these times limiting the need to revert to extrapolation as a warning base.

A comparison of satellite derived positions and the JTWC Best Track positions is shown in Table 2-3. The relative accuracies of satellite positions can be obtained from this table. However, the values are also a function of the Best Track smoothing process.

Satellite derived fixes were also obtained from: USN ships equipped for DMSP direct readout; the National Environmental Satellite Service using NOAA and GOES data; Fleet Weather Facility (FLEWEAFAC), Suitland, Maryland using stored NOAA data; and, from the Naval Weather Service Environmental Detachment at Diego Garcia using NOAA APT data. This information was invaluable to the warning service. Since these were secondary sources, they were not put through the end of the year evaluation.

TABLE 2-3. Mean Deviations (nm) of DMSP Derived Tropical Cyclone Positions from JTWC Best Track Positions, 1974-1977 (all sites). Number of cases shown in parentheses.

PCN	1974 (ALL SITES)	1975 (ALL SITES)	1976 (ALL SITES)	1977 (ALL SITES)
1	13.6 (224)	11.8 (214)	12.4 (131)	15.7 (134)
2	17.4 (37)	20.4 (35)	20.1 (124)	19.1 (47)
3	20.1 (422)	21.2 (271)	21.7 (161)	22.4 (141)
4	23.9 (70)	22.4 (50)	29.3 (152)	30.0 (75)
5	35.4 (342)	34.2 (323)	40.4 (247)	37.7 (357)
6	49.4 (108)	44.7 (71)	49.0 (153)	40.9 (247)
1&2	14.2 (261)	13.0 (249)	16.1 (255)	16.6 (181)
3&4	20.6 (492)	21.4 (321)	25.4 (313)	25.0 (216)
5&6	38.8 (450)	36.1 (394)	43.7 (400)	39.0 (604)

6. RADAR RECONNAISSANCE SUMMARY

The 1977 Typhoon season produced a total of 385 radar center fixes accounting for 16.3% of all tropical cyclone fixes in the western Pacific. One radar fix was taken by a WC-130 aircraft of the 54th Weather Reconnaissance Squadron during Tropical Storm Ruth. All other radar fixes were taken by land or ship. The number of storms that were within radar acquisition range this year was 11 compared to 12 last year, but the total number of radar fixes this year was only one half of last year's number. This apparent contradiction is explained by a smaller number of well organized storms especially of the Super Typhoon classification, one versus four last year.

The WMO radar code defines three categories of accuracy for the various national meteorological agencies' radar reports. These categories are: good [within 10 km (5.4 nm)], fair [within 10-30 km (5.4-16.2 nm)] and poor [within 30-50 km (16.2-27 nm)]. This year 287 radar fixes were coded in this manner of which 62% were good, 27% fair and 11% poor. Compared to the JTWC best track, the mean vector deviation for land radar sites was 18.3 nm (34 km) compared to 11.6 nm (21 km) last year and for the one aircraft fix the deviation was 32.4 nm (60 km) compared to 16.0 nm (30 km) last year. This decrease in accuracy is attributable to the smaller number of well organized storms.

Of the total 385 radar fixes this year,

the national meteorological agencies of various countries accounted for 75%; U. S. Air Force, Air Weather Service, Sites 19%; and 5% from aircraft control and warning (AC&W) sites. This year the land radar sites in Taiwan provided a much greater percentage of radar fixes (31%) as compared to previous years due to five storms (Ruth, Thelma, Vera, Amy and Dinah) passing through their area of acquisition. The extensive radar network of the Japan-Ryuku area provided 37% of the total with 13% from Guam and 3% from the Royal Observatory in Hong Kong. The Republic of the Philippines also noticeably increased their coverage, up to 12%, as five storms (Thelma, Sarah, Freda, Kim and Mary) moved through their area. As in previous years, there were no radar fixes taken within the Indian Ocean area.

Of the eleven storms making up this year's number of radar fixes, three typhoons (Babe, Kim and Vera) accounted for 58% of the total. Typhoons Babe and Vera were tracked by the Japanese Meteorological Agency and Taiwan radar sites to account for 40% of the total. All three of these storms were fixed simultaneously by three radar sites on more than one occasion during their tracks.

7. COMMUNICATIONS

A new piece of communication equipment, the Naval Environmental Display Station (NEDS) was installed at FWC/JTWC in 1977. The NEDS is an addition to the existing variety of JTWC's communication systems which include the Automatic Voice Switching Network (AUTOVON), the Automatic Digital Network (AUTODIN), the Naval Environmental Data Network (NEDN), and the Air Force Automated Weather Network (AWN). The NEDS has been available, although not yet fully operational, since mid-1977 and promises to add significantly to the efficiency of data receipt and warning preparation. It will eventually replace the current FWC computer which is now providing the graphical display of much of the basic meteorological intelligence received via the NEDN.

The AUTOVON serves as a vital communication link and is a back-up for primary communication systems. AUTODIN is used for dissemination of warnings and other related bulletins which are concurrently transmitted via the AWN. These messages are also relayed for further transmission over US Navy Fleet Broadcasts and to all ships and island stations via US Coast Guard CW (Continuous Wave Morse Code) and voice communications. Inbound message traffic for JTWC is received via AUTODIN addressed to FLEWEACEN GUAM.

Actual message tape preparation and entering of messages into the AUTODIN and AWN circuits is performed by the Nimitz Hill Naval Telecommunications Center (NTCC) of the Naval Communications Area Master Station Western Pacific.

The main data source for JTWC analyses is a dedicated AWN circuit linking JTWC directly to the Automated Digital Weather Switch (ADWS) at Clark AB, RP. The ADWS selects and routes the large volume of meteorological reports necessary to satisfy JTWC requirements for the right data at the right time. At times of primary circuit outage, JTWC has other, though limited and less efficient, teletype data sources. One of these provides data to and from the U. S. Trust Territory, Guam, and the Northern Marianas.

High frequency single sideband (HF/SSB) and phone patch through the USAF aeronautical station at Andersen AFB (Andersen Airways) is the normal means of communication between weather reconnaissance aircraft and JTWC. Depending on storm location or propagation difficulties, the same direct voice contact can be established via AUTOVON through other USAF aeronautical stations, such as Clark, Yokota or Hickam Airways. USAF weather stations, colocated with the aeronautical stations, are designated weather reconnaissance monitors who are charged with acquiring, checking and transmitting reconnaissance reports into the AWN. As does JTWC, these monitor stations receive the data via HF/SSB and phone patch and often copy reports simultaneously with JTWC for efficiency and accuracy.

Reconnaissance aircraft provide vortex data in two stages. The preliminary data, requiring minimum onboard computations, contain enough information to permit JTWC forecasters to begin preparation of warnings. The average delay between the time the preliminary fix data messages were obtained and the time they were copied at JTWC was 19 minutes in 1977 as compared to 15 minutes in 1976, and 21 minutes in 1975. Similar delay times for the second stage, or complete eye/center fix data were 53 minutes in 1977, 30 minutes in 1976 and 49 minutes in 1975. The large difference between the 1976 and 1977 averages is in part due to cases when extremely poor propagation conditions caused exceptionally long delays. Further statistics relating to the efficiency of air/ground aircraft reconnaissance communications are given in Table 2-4.

TABLE 2-4. 1973-1977 AIR/GROUND DELAY STATISTICS FOR AIRCRAFT RECONNAISSANCE

	1973	1974	1975	1976	1977
%Complete fix messages delayed over one hour	20	19	20	21	[illegible]
%Complete fix messages received after warning time	10.1	4.9	3.7	4.7	4.9

CHAPTER III – RESEARCH & DEVELOPMENT SUMMARY

1. GENERAL

One of the tasks of the Joint Typhoon Warning Center is to conduct applied tropical cyclone research, as time and resources permit. The objective of this research is to improve operational forecasts. This research primarily involves the development of forecasting and analysis techniques from published studies and preparing reports requested by outside agencies. Meteorologists from agencies such as the Naval Environmental Prediction Research Facility, the Naval Postgraduate School, Det 4, HQ Air Weather Service, Det 1, 1st Weather Wing and the 54th Weather Reconnaissance Squadron often collaborate on these projects. The following abstracts summarize the year's research and development projects completed or still in progress.

2. OPERATIONAL APPLICATION OF A TROPICAL CYCLONE RECURVATURE/NON-RECURVATURE STUDY BASED ON 200MB WIND FIELDS

(Guard, C. P., FLEWEACEN/JTWC TECH NOTE 77-1)

In his paper, Tropical Cyclone Motion and Surrounding Parameter Relationships, John E. George demonstrated the relationship between various 200 mb wind fields and recurvature/non-recurvature. Evaluation of the wind fields with data independent of George's study indicated that significant modification of his study was required to produce an operationally applicable recurvature/non-recurvature study. Synoptic analysis revealed two distinct environments affecting tropical cyclones, a Winter Regime and a Summer Regime. All tropical cyclones were stratified accordingly. By integrating the results of the evaluation with results from rigorous synoptic and statistical analyses, operationally applicable recurvature/non-recurvature techniques were developed for, both, Winter Regime and the Summer Regime tropical cyclones.

3. TROPICAL CYCLONE CENTER FIX DATA FOR THE 1976 STORM SEASON

(Staff, FLEWEACEN/JTWC TECH NOTE 77-2)

This publication is a listing of all center fix data for each tropical cyclone occurring in the western North Pacific, Bay of Bengal, and Arabian Sea during 1976. (Note: The 1977 center fix data is included in Chapter VI herein, and will not be published as a separate report.)

4. EVALUATION OF THE DVORAK IR TECHNIQUE FOR USE WITH DMSP DATA

(Corey, T. D., DET 1, 1ST WEATHER WING)

An evaluation was made of the Dvorak IR technique (1975) using nighttime DMSP IR data. The data included all tropical storms and typhoons occurring during the period 1 June through 31 December 1976. A comparison was made between the Dvorak IR intensity estimate and the corresponding best track intensity. The results showed that the Dvorak IR technique is useful in describing intensity trends but not in making independent intensity estimates.

5. A CLIMATOLOGY OF TROPICAL CYCLONES FOR THE PERIOD 1971-1976

(Willms, G. R., FLEWEACEN/JTWC)

An analysis was made of all tropical cyclones occurring in the JTWC area of responsibility during 1971-1976. The analysis determined: the average speed of tropical cyclones, by month, traversing each 5° latitude/longitude square in the western North Pacific; and the average annual number of occurrences of tropical cyclones by 5° latitude/longitude square in the western North Pacific, Bay of Bengal and Arabian Sea. This study updated previous work.

6. RELATIONSHIPS BETWEEN THE TEMPORAL VARIATION OF EQUIVALENT POTENTIAL TEMPERATURE AND TROPICAL CYCLONE INTENSITY

(Hassebrock, A. W., FLEWEACEN/JTWC)

The use of equivalent potential temperature as a predictor of tropical cyclone intensity has been studied previously by Sikora (ATR, 1975) and Milwer (ATR, 1976). These studies examined the equivalent potential temperature (magnitude) in relation to tropical cyclone intensity and found inconclusive results. In this study, aircraft center fix data for 1976-1977 tropical cyclones were analyzed to determine if temporal variations, versus magnitude, of equivalent potential temperature had any relationship with tropical cyclone intensification. Two types of variations were found which show potential as intensity forecasting aids. These two techniques will be evaluated during the 1978 storm season.

7. THE TRANSITIONING OF TROPICAL CYCLONES TO EXTRATROPICAL CYCLONES

(Guard, C. P., FLEWEACEN/JTWC and Brand, Samson, NEPRF)

An examination was made of the post-recurvature transition of tropical cyclones to extratropical cyclones. Particular emphasis is placed on the short-lived intensification that tropical cyclones sometimes undergo after recurvature, as cold air is initially advected into the region of the wall cloud.

8. FUTURE AIRCRAFT RECONNAISSANCE STORM TRACKS

(Staff, FLEWEACEN/JTWC, DET 4, HQ AWS AND 54 WRS)

An examination was made of storm tracks needed to satisfy future data requirements. New tracks were developed to provide increased peripheral data for the 1978 season. Additional tracks were discussed which may be

required to provide the necessary input data for the FNWC Tropical Cyclone Model.

9. TROPICAL CHART SERIES FOR SEPTEMBER 1975

(Sokol, D., Willms, G. R. and Guard, C. P., FLEWEACEN/JTWC)

A series of surface/gradient and 200 mb charts were prepared for the Naval Postgraduate School. These charts depicted a period of high storm activity during September 1975 and are now an integral part of the laboratory instruction at the school.

10. TROPICAL WEATHER STUDY GUIDE

(Fukada, E. M., FLEWEACEN/JTWC)

A study guide on tropical weather was prepared for the Navy Forecasters School. The study guide, which was in a programmed text format, discusses the climatology, synoptics and dynamics of tropical weather.

Note: Anyone desiring additional information on any of the above subjects should contact the Director, JTWC.

CHAPTER IV — SUMMARY OF TROPICAL CYCLONES

1. WESTERN NORTH PACIFIC TROPICAL CYCLONES

During 1977, the western North Pacific experienced the smallest number of typhoons since JTWC's formation in 1959. Of the 21 numbered tropical cyclones occurring during 1977 (Table 4-1), only eleven developed to mature typhoons, eight peaked out as tropical storms, and two did not develop beyond depression stages. Tables 4-2 and 4-3 show that both the number of tropical storms and typhoons were well below the quantity normally observed. During the season, only Babe reached the 130 kt (67 m/sec) intensity necessary to be classified as a "super" typhoon. The months, January through June, were completely void of typhoons and had only a total of two tropical storms, Patsy in March and Ruth in June. This early season lull in activity was similar to that observed during 1973 and 1975. Tropical cyclone occurrences were near normal during July, but fell to a record low for August when no typhoons and only a single tropical storm was observed. During late July the southwest monsoon of India and Southeast Asia became very deep and intense, extended anomalously into the western North Pacific, and persisted for weeks. The monsoon trough was oriented in an east-northeast to west-southwest direction from Hainan Island to the Bonin Islands. Several cyclonic eddies formed within the trough as Monsoon Depressions, i.e., systems characterized by broad surface circulation centers, highly asymmetric wind fields, surface winds less than 34 kt (18 m/sec), greatest intensity at 5,000 to 10,000 ft (1470-2940 m), and strong vertical shear.

TABLE 4-1.
1977 TROPICAL CYCLONES

PACIFIC AREA

CYCLONE	TYPE	NAME	PRD OF WRNG	CALENDAR DAYS OF WARNING	MAX SFC WIND	MIN OBS SLP	NO. OF WARNINGS TOTAL	NO. OF WARNINGS AS TY	DISTANCE TRAVELLED
01	TS	PATSY	23 MAR-31 MAR	9	50	981	25	--	1190
02	TD	TD 02	26 MAY-27 MAY	2	30	1001	6	--	318
03	TS	RUTH	14 JUN-17 JUN	4	60	980	14	--	874
04	TD	TD 04	05 JUL-06 JUL	2	30	995	6	--	396
05	TY	SARAH	16 JUL-21 JUL	6	75	970	21	3	1548
06	TY	THELMA	21 JUL-26 JUL	6	85	957	21	11	1092
07	TY	VERA	28 JUL-01 AUG	5	110	926	18	13	814
08	TS	WANDA	31 JUL-04 AUG	5	45	986	17	--	936
09	TS	AMY	20 AUG-23 AUG	4	40	990	16	--	936
10	STY	BABE	02 SEP-10 SEP	9	130	906	36	20	2436
11	TS	CARLA	03 SEP-05 SEP	3	35	994	9	--	614
12	TY	DINAH	14 SEP-23 SEP	10	75	964	38	10	1998
13	TS	EMMA	15 SEP-20 SEP	6	60	966	21	--	1680
14	TS	FREDA	23 SEP-25 SEP	3	55	997	9	--	859
15	TY	GILDA	03 OCT-10 OCT	8	70	968	30	8	2332
16	TS	HARRIET	16 OCT-20 OCT	5	55	984	19	--	1544
17	TY	IVY	21 OCT-27 OCT	7	90	945	24	12	1877
18	TY	JEAN	*	6	65	972	20	3	1015
19	TY	KIM	06 NOV-17 NOV	12	125	916	44	25	1338
20	TY	LUCY	28 NOV-07 DEC	10	115	919	39	16	3922
21	TY	MARY	20 DEC-03 JAN	15	100	947	59	15	4002
			1977 TOTALS	124**			492	136	

INDIAN OCEAN AREA

CYCLONE	TYPE	NAME	PRD OF WRNG	CALENDAR DAYS OF WARNING	MAX SFC WIND	MIN OBS SLP	NO. OF WARNINGS TOTAL	NO. OF WARNINGS AS TY	DISTANCE TRAVELLED
	TC	17-77	11 MAY-13 MAY	3	60	980	4	--	374
	TC	18-77	10 JUN-13 JUN	4	60	985	6	--	510
	TC	19-77	29 OCT-31 OCT	3	40	994	5	--	691
	TC	21-77	*	11	70	979	19	4	1387
	TC	22-77	15 NOV-19 NOV	5	115	930	10	8	875
			1977 TOTALS	21**			44	12	

*JEAN 28 OCT-31 OCT AND 02 NOV-03 NOV
21-77 10 NOV-12 NOV AND 14 NOV-21 NOV

**OVERLAPPING DAYS INCLUDED ONLY ONCE IN SUM

TABLE 4-2 FREQUENCY OF TROPICAL STORMS AND TYPHOONS BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
AVERAGE (1945-58)	0.4	0.1	0.4	0.5	0.8	1.3	3.0	3.9	4.1	3.3	2.7	1.1	22.0
1959	0	1	1	1	0	0	3	6	6	4	2	2	26
1960	0	0	0	1	1	3	3	10	3	4	1	1	27
1961	1	1	1	1	3	2	5	4	6	5	1	1	31
1962	0	1	0	1	2	0	6	7	3	5	3	2	30
1963	0	0	0	1	1	3	4	3	5	5	0	3	25
1964	0	0	0	0	2	2	7	9	7	6	6	1	40
1965	2	2	1	1	2	3	5	6	7	2	2	1	34
1966	0	0	0	1	2	1	5	8	7	3	2	1	30
1967	1	0	2	1	1	1	6	8	7	4	3	1	35
1968	0	0	0	1	1	1	3	8	3	6	4	0	27
1969	1	0	1	1	0	0	3	4	3	3	2	1	19
1970	0	1	0	0	0	2	2	6	4	5	4	0	24
1971	1	0	1	3	4	2	8	4	6	4	2	0	35
1972	1	0	0	0	1	3	6	5	4	5	2	3	30
1973	0	0	0	0	0	0	7	5	2	4	3	0	21
1974	1	0	1	1	1	4	4	5	5	4	4	2	32
1975	1	0	0	0	0	0	2	4	5	5	3	0	20
1976	1	1	0	2	2	2	4	4	5	1	1	2	25
1977	0	0	1	0	0	1	4	1	5	4	2	1	19
AVERAGE (1959-77)	0.5	0.4	0.4	0.8	1.2	1.6	4.6	5.6	4.9	4.2	2.5	1.2	27.9

TABLE 4-3 FREQUENCY OF TYPHOONS BY MONTH AND YEAR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
AVERAGE (1945-58)	0.4	0.1	0.3	0.4	0.7	1.1	2.0	2.9	3.2	2.4	2.0	0.9	16.3
1959	0	0	0	1	0	0	1	5	3	3	2	1	20
1960	0	0	0	1	0	2	2	8	0	4	1	1	19
1961	0	0	1	0	2	1	3	3	5	3	1	1	20
1962	0	0	0	1	2	0	5	7	2	4	3	0	24
1963	0	0	0	1	1	2	3	3	3	4	0	2	19
1964	0	0	0	0	2	2	6	3	5	3	4	1	26
1965	1	0	0	1	2	2	4	3	5	2	1	0	21
1966	0	0	0	1	2	1	3	6	4	2	0	1	20
1967	0	0	1	1	0	1	3	4	4	3	3	0	20
1968	0	0	0	1	1	1	1	4	3	5	4	0	20
1969	1	0	0	1	0	0	2	3	2	3	1	0	13
1970	0	1	0	0	0	1	0	4	2	3	1	0	12
1971	0	0	0	3	1	2	6	3	5	3	1	0	24
1972	1	0	0	0	1	1	4	4	3	4	2	2	22
1973	0	0	0	0	0	0	4	2	2	4	0	0	12
1974	0	0	0	0	1	2	1	2	3	4	2	0	15
1975	1	0	0	0	0	0	1	3	4	3	2	0	14
1976	1	0	0	1	2	2	2	1	4	1	1	0	15
1977	0	0	0	0	0	0	3	0	2	3	2	1	11
AVERAGE (1959-77)	0.3	0.1	0.1	0.7	0.9	1.1	2.8	3.6	3.2	3.2	1.6	0.5	18.3

Upon relaxation of the deep, southwest monsoon flow, Tropical Storm Wilda developed, but did not exceed 45 kt (23 m/sec) intensity in the environment of strong vertical shear. As Wilda moved east of Japan, she caused the monsoonal flow over the western Pacific to move toward the north, rather than toward the climatologically favored regions where tropical cyclones normally develop. This northward flow toward low pressure continued as several extratropical systems developed near the sea of Japan, south of the normal regions for extratropical cyclogenesis in August. About the middle of August, the deep, southwest monsoon flow again intensified, and again several Monsoon Depressions formed. When the monsoon finally weakened, Tropical Storm Amy developed, but barely to 40 kt (21 m/sec). Amy again drew the western Pacific region of low pressure far north of its normal position, preventing establishment of a significant near-equatorial trough (NET). In fact, during much of August, pressures were much above normal in the tropics and easterly winds dominated the equatorial regions, helping to prevent cyclogenesis. By early September, pressures had fallen in the tropics, flow was back to normal, and Super Typhoon Babe developed in the NET, south of Guam. The remainder of the 1977 season for both tropical storms and typhoons was near normal.

During 1977, 26 Tropical Cyclone Formation Alerts were issued. Of these, 20 or 77% developed into significant tropical cyclones (Table 4-4). No formation alert was issued for Typhoon Jean. Instead, a warning was issued in order to provide more information to a U. S. Navy ship approaching the system. The average lead time between issuance of a Tropical Cyclone Formation Alert and the first warning was 21 hours, with a minimum of 4 hours with Tropical Storm Wanda and a maximum of 48 hours with Typhoon Kim.

Only 12 multiple-storm days occurred in 1977 (Table 4-5). This is the lowest number of multiple-storm days observed since JTWC began keeping records in 1959. Like 1970 and 1975, there were no days in 1977 in which three or more western North Pacific tropical cyclones occurred simultaneously.

The 1977 tropical cyclone season was characterized by an abundance of poorly defined cyclones of relatively small radial extent of which many exhibited numerous erratic movements. The weaker cyclones were often inhibited from development by an unusually large and intense subtropical ridge and shear of the horizontal winds with height. In contrast, periods of weak steering currents resulted in five storms executing one or more loops each. Overall losses of life and property were thankfully small. Taiwan, however, survived a three-month drought, then experienced two of the worst typhoons in 80 years, Vera and Thelma.

TABLE 4-4.

PACIFIC AREA
TROPICAL CYCLONE FORMATION ALERT SUMMARY

YEAR	NUMBER OF ALERT SYSTEMS	ALERT SYSTEMS WHICH BECAME NUMBERED TROPICAL CYCLONES	TOTAL NUMBERED TROPICAL CYCLONES	DEVELOPMENT RATE
1972	41	29	32	71%
1973	26	22	23	85%
1974	35	30	36	86%
1975	34	25	25	74%
1976	34	25	25	74%
1977	26	20	21	77%

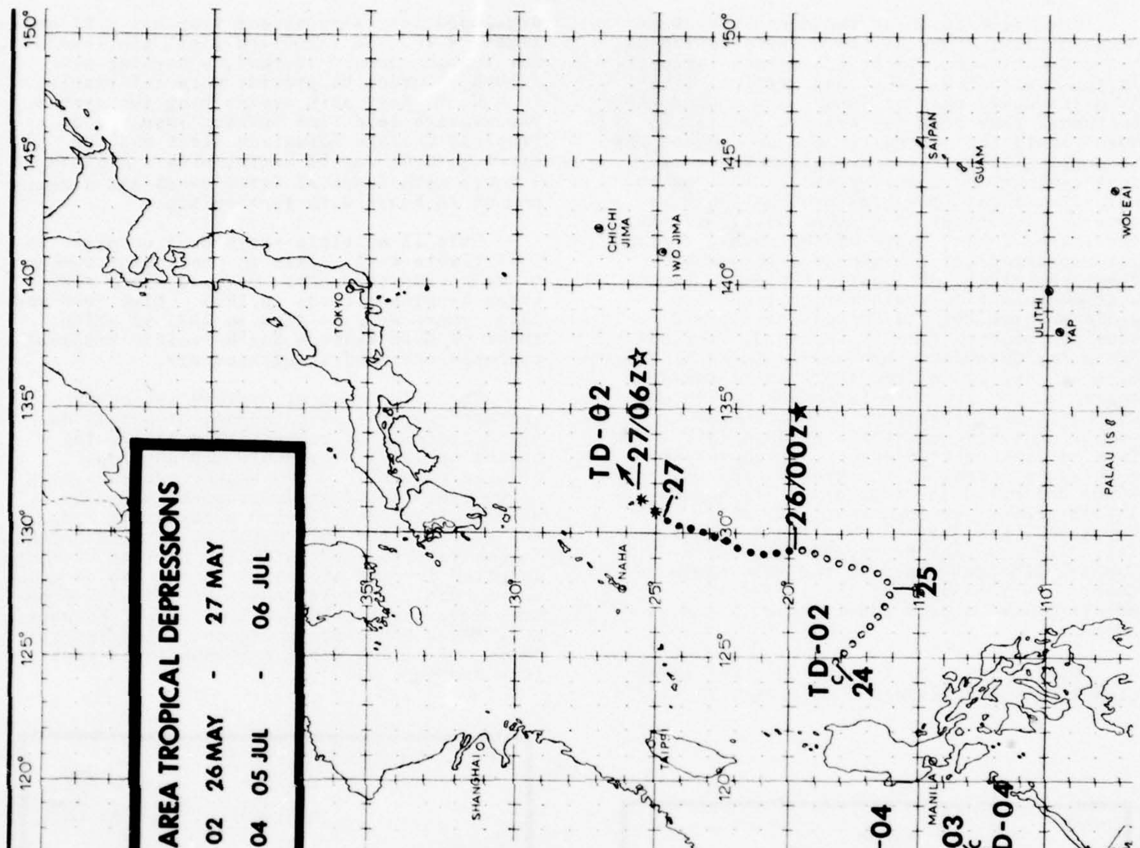
MONTHLY DISTRIBUTION

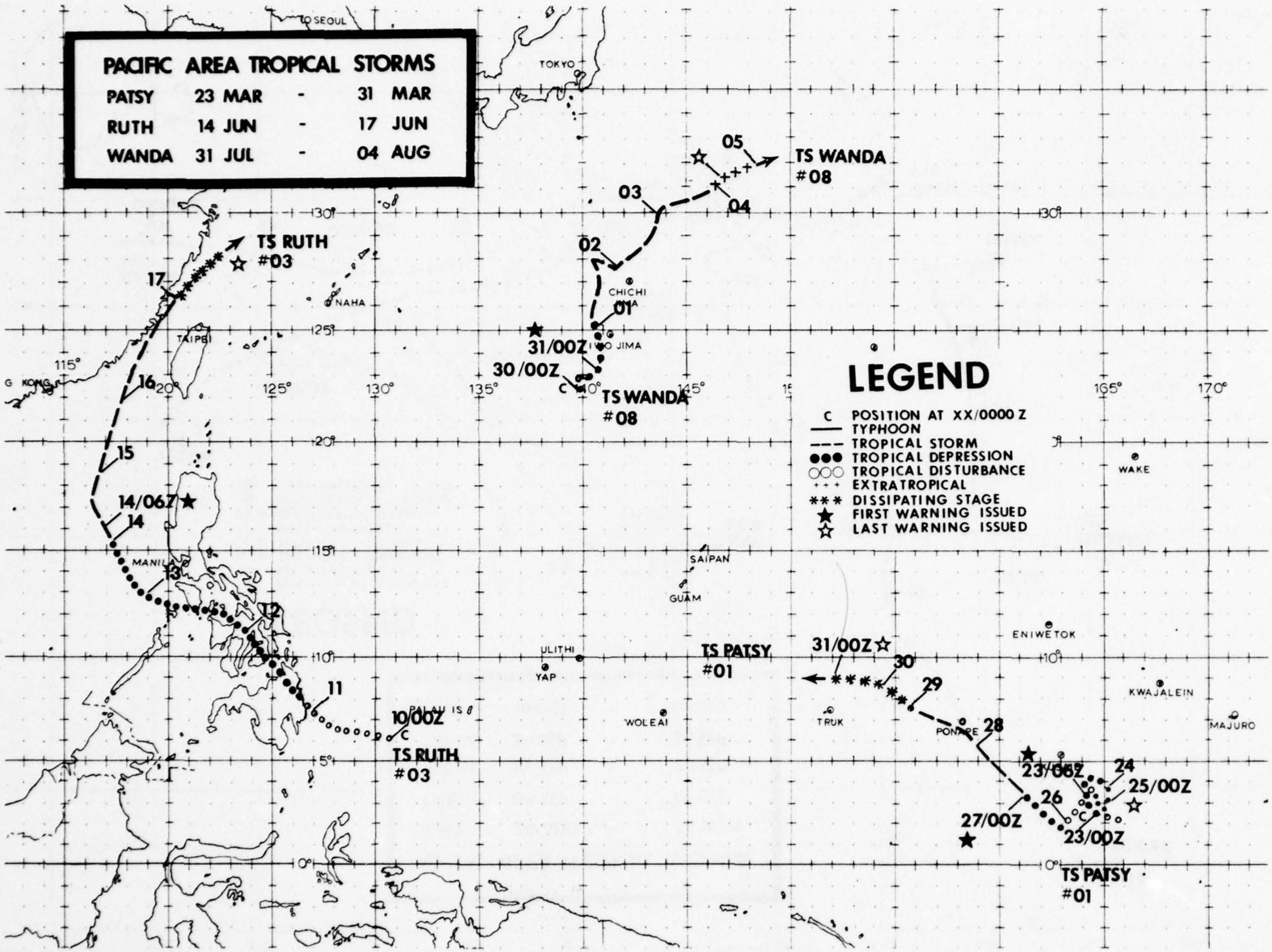
	J	F	M	A	M	J	J	A	S	O	N	D
FORMATION ALERTS	0	0	1	0	1	1	6	5	6	3	2	1

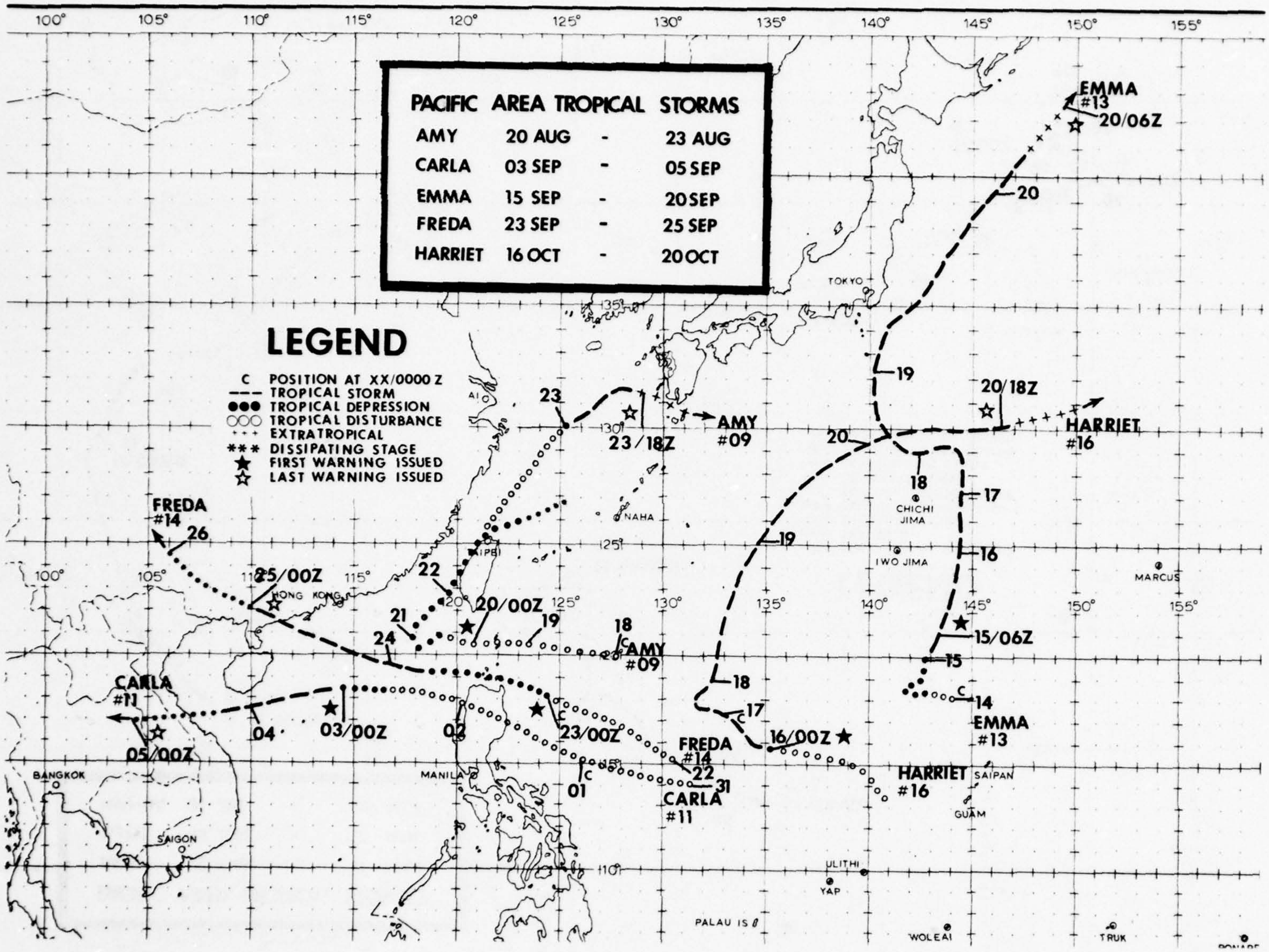
TABLE 4-5. SUMMARY OF JTWC WARNINGS 1959-1977.

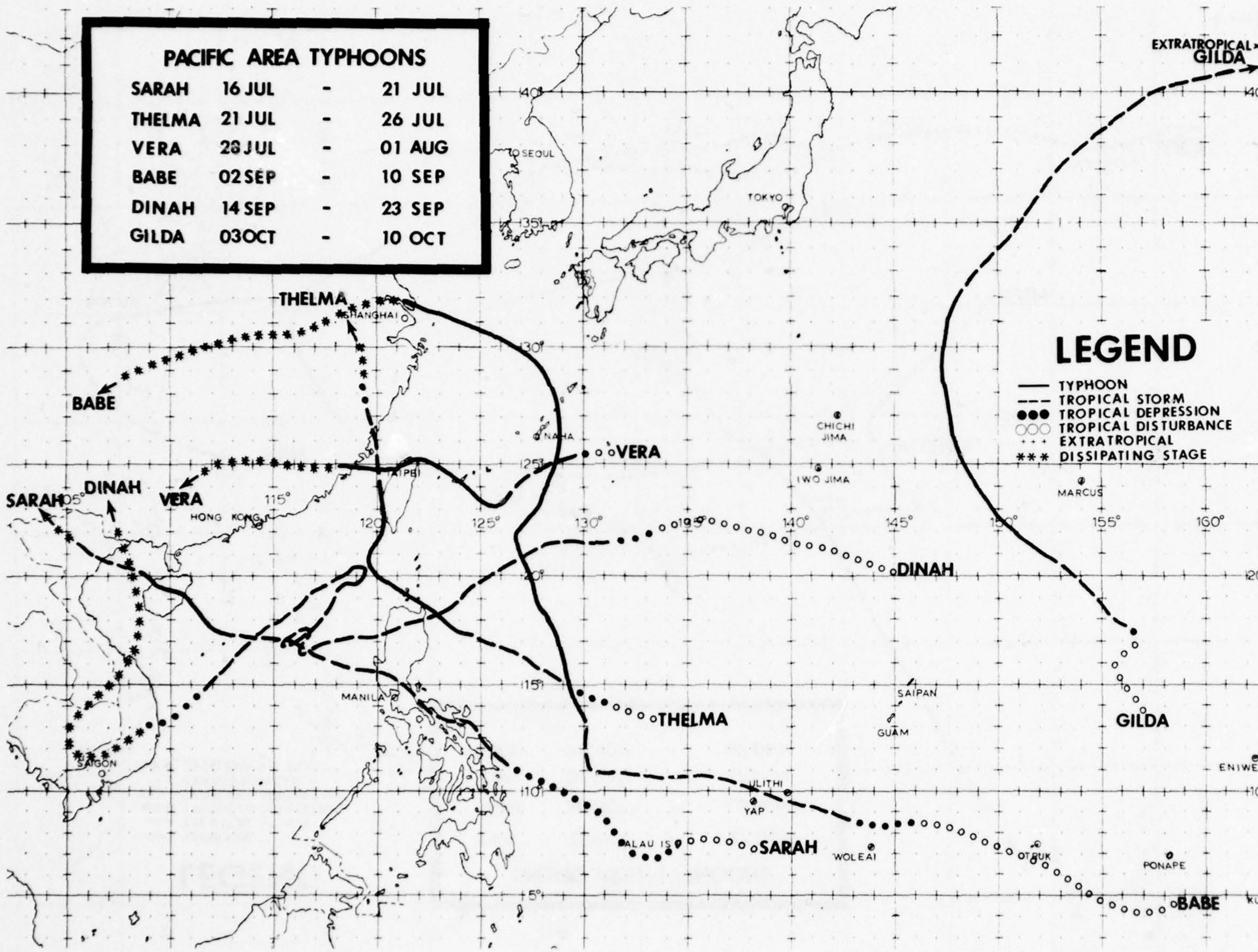
	WESTERN NORTH PACIFIC		NORTH INDIAN OCEAN		CENTRAL NORTH PACIFIC	
	1977	AVERAGE 1959-76	1977	AVERAGE 1971-76*	1977	AVERAGE 1971-76
TOTAL NUMBER OF WARNINGS	492	679	44	26	0	35
CALENDAR DAYS OF WARNINGS	124	142	21	16	0	10
NUMBER OF WARNING DAYS WITH TWO CYCLONES	12	48	5	1	0	1
NUMBER OF WARNING DAYS WITH THREE OR MORE CYCLONES	0	9	0	0	0	0
TROPICAL DEPRESSIONS	2	5	-	-	0	1
TROPICAL STORMS	8	11	-	-	0	1
TYPHOONS/HURRICANES	11	19	-	-	0	1
I.O. TROPICAL CYCLONES	-	-	5	4	-	-
TOTAL TROPICAL CYCLONES	21	34	5	4	0	3

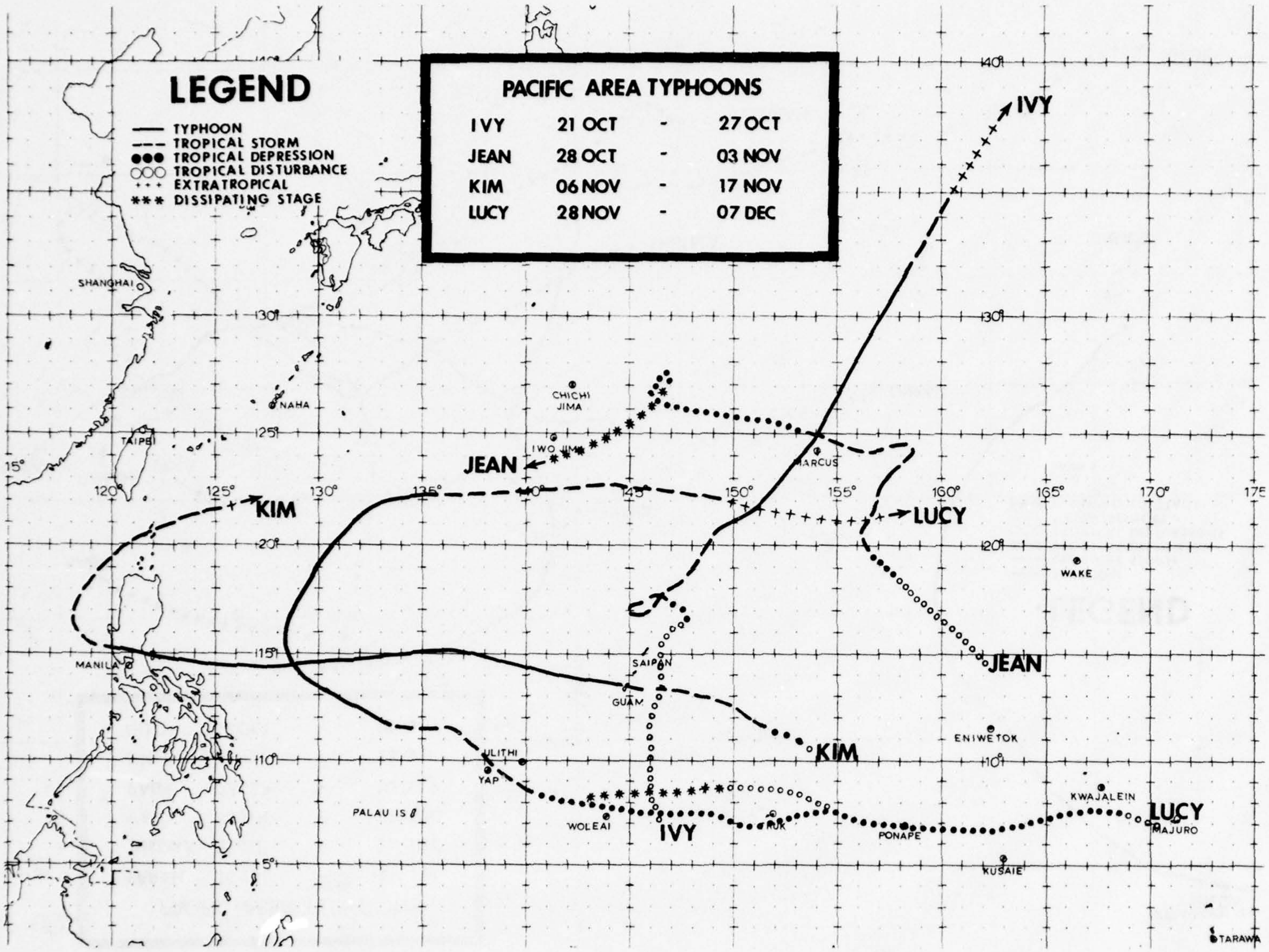
* 1971-1974 DOES NOT INCLUDE ARABIAN SEA

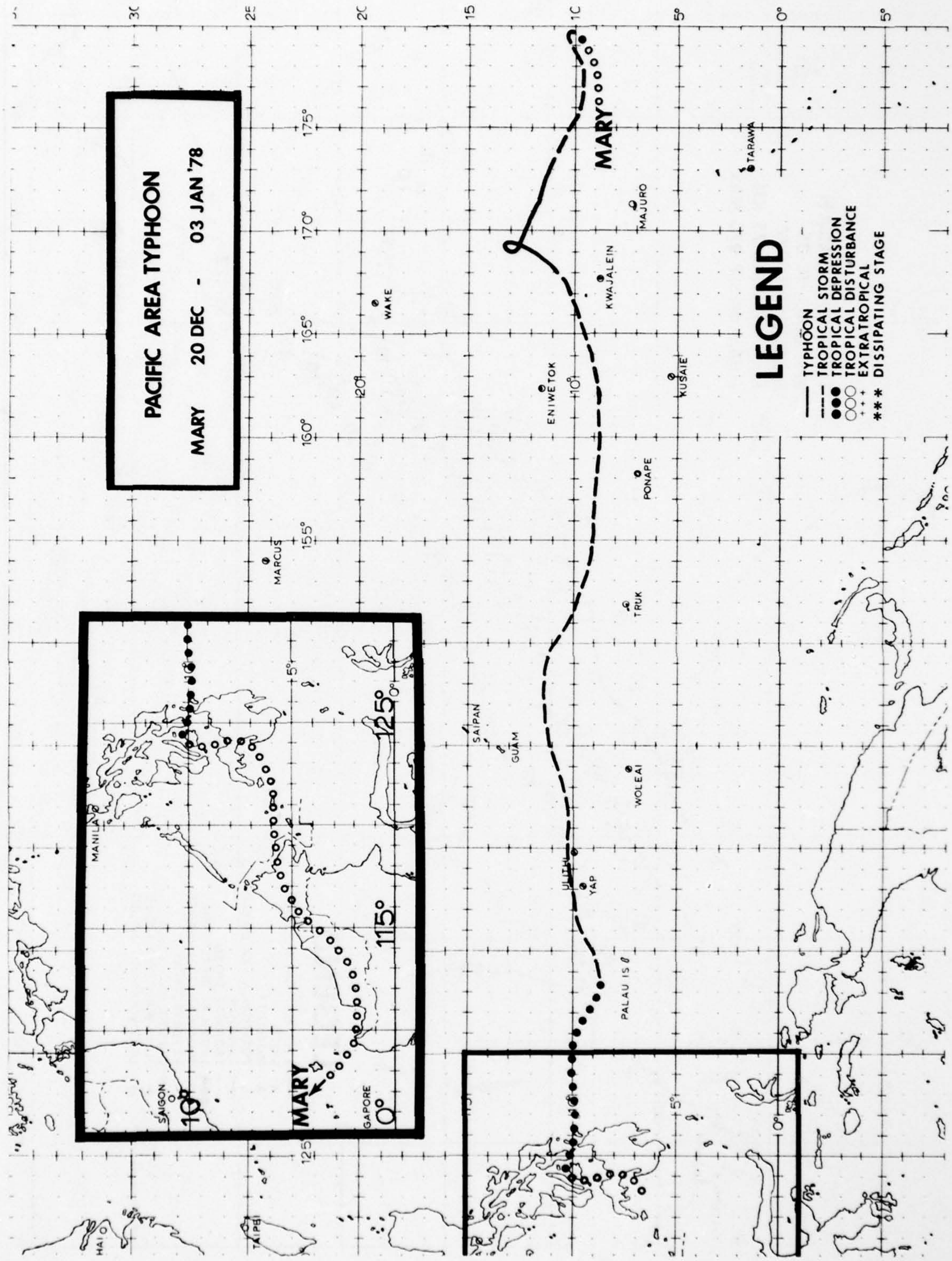

PACIFIC AREA TROPICAL DEPRESSIONS
TD-02 26 MAY - 27 MAY
TD-04 05 JUL - 06 JUL
LEGEND
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TD-02
27/06Z
27
26/00Z
25
24
TD-04
06/06Z
06
05/00Z
04
03
TOKYO
SHANGHAI
NAHA
TAIPEI
MANILA
SAIGON
BANGKOK
RANGOON
PT. BLAIR
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
PALAU IS

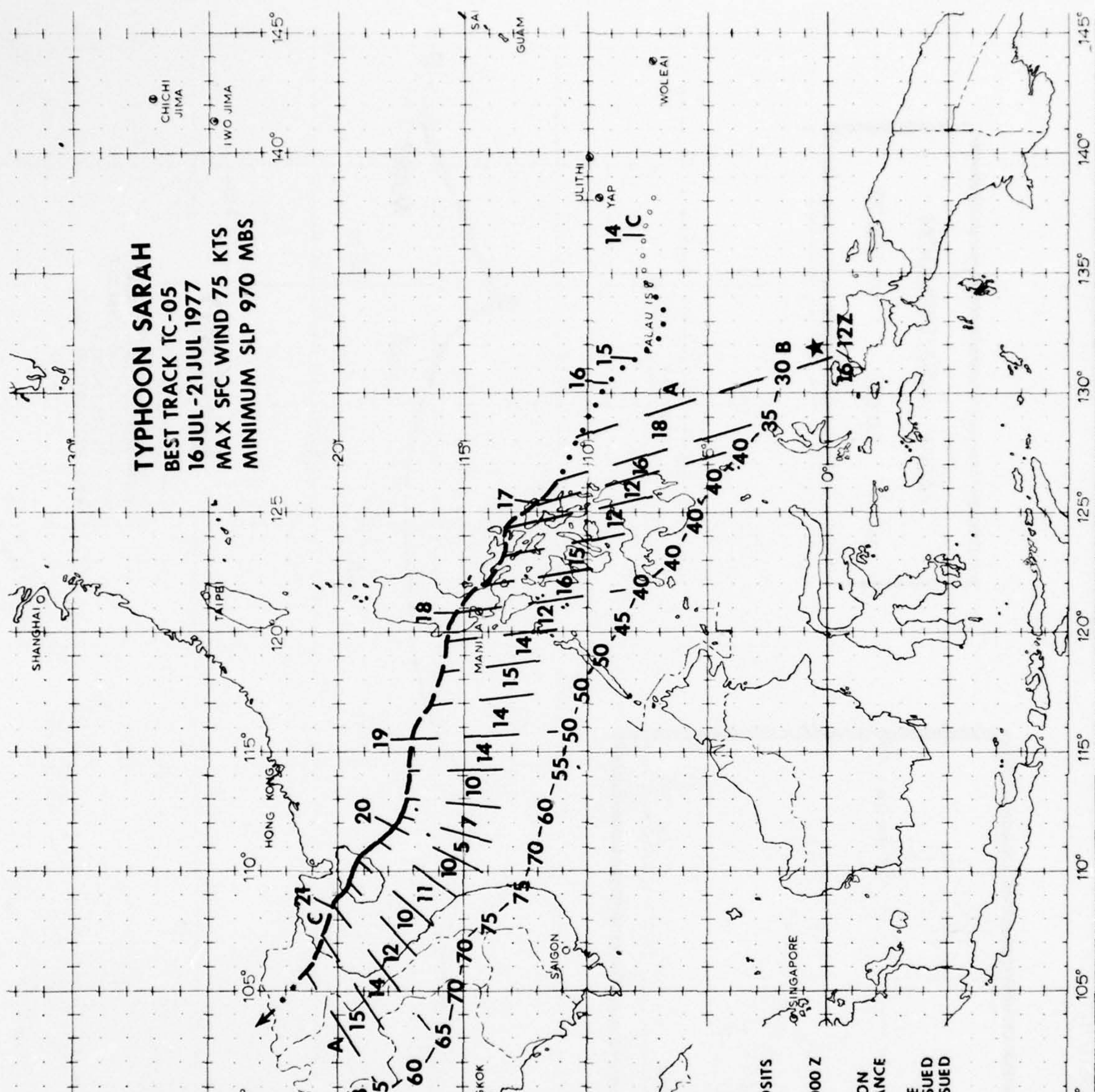

PACIFIC AREA TROPICAL STORMS
PATSY 23 MAR - 31 MAR
RUTH 14 JUN - 17 JUN
WANDA 31 JUL - 04 AUG
LEGEND
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TS RUTH
#03
TS WANDA
#08
TS PATSY
#01
SEOUL
TOKYO
NAHA
TAIPEI
MANILA
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
ENIWETOK
KWAJALEIN
MAJURO
WAKE
PALAU IS
G KONG
14/06Z
10/00Z
31/00Z
30/00Z
23/06Z
25/00Z
27/00Z
23/00Z
115°
120°
125°
130°
135°
140°
145°
165°
170°
30°
25°
20°
15°
10°
5°


PACIFIC AREA TROPICAL STORMS
AMY 20 AUG - 23 AUG
CARLA 03 SEP - 05 SEP
EMMA 15 SEP - 20 SEP
FREDA 23 SEP - 25 SEP
HARRIET 16 OCT - 20 OCT
LEGEND
C POSITION AT XX/0000 Z
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
EMMA #13
20/06Z
HARRIET #16
20/18Z
AMY #09
23/18Z
FREDA #14
CARLA #11
25/00Z
20/00Z
03/00Z
05/00Z
23/00Z
16/00Z
15/06Z
TOKYO
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
HONG KONG
MANILA
BANGKOK
SAIGON
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
SAIPAN
GUAM


PACIFIC AREA TYPHOONS
SARAH 16 JUL - 21 JUL
THELMA 21 JUL - 26 JUL
VERA 28 JUL - 01 AUG
BABE 02 SEP - 10 SEP
DINAH 14 SEP - 23 SEP
GILDA 03 OCT - 10 OCT
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
EXTRATROPICAL
GILDA
THELMA
BABE
VERA
DINAH
SARAH
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
SAIGON
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
ENIWETOK
115°
120°
125°
130°
140°
145°
155°
160°
140
135
130
125
120
115
110
5°


LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
PACIFIC AREA TYPHOONS
IVY 21 OCT - 27 OCT
JEAN 28 OCT - 03 NOV
KIM 06 NOV - 17 NOV
LUCY 28 NOV - 07 DEC
IVY
JEAN
KIM
LUCY
SHANGHAI
TAIPEI
NAHA
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
ENIWETOK
WAKE
KWAJALEIN
MAJURO
KUSAIE
TARAWA
120°
125°
130°
135°
140°
145°
150°
155°
160°
165°
170°
175
5°
10°
15°
20°
25°
30°
40°


PACIFIC AREA TYPHOON
MARY 20 DEC - 03 JAN '78
LEGEND
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
MARY
TARAWA
MAJURO
KWAJALEIN
KUSAIE
WAKE
ENIWETOK
PONAPE
MARCUS
TRUK
SAIPAN
GUAM
WOLEAI
ULITHI
YAP
PALAU IS
TAIPEI
MANILA
SAIGON
GAPORE
175°
170°
165°
160°
155°
125°
115°


TYPHOON SARAH
BEST TRACK TC-05
16 JUL-21 JUL 1977
MAX SFC WIND 75 KTS
MINIMUM SLP 970 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SHANGHAI
TAIPEI
HONG KONG
MANILA
SAIGON
BANGKOK
RANGOON
SINGAPORE
PT. BLAIR
DACCA
CALCUTTA
CHICHI JIMA
IWO JIMA
GUAM
ULITHI
YAP
WOLEAI
PALAU IS
16/12Z
21/12Z

The first typhoon of the 1977 season did not occur until mid-July. Meteorological satellite data on the morning of July 13th showed an area of convection some 225 nm (417 km) east of Koror (WMO 91408) in the Palau Islands. This tropical disturbance meandered on a 10 kt (19 km/hr), westward track and crossed Koror at 1200Z on the 14th. On the morning of the 15th, the system exhibited increased organization and a Tropical Cyclone Formation Alert was issued at 0000Z. Simultaneously, the disturbance took a more climatological, west-northwestward track and showed evidence of possessing multiple circulation centers.

During the 16th, satellite data hinted that the western-most circulation center was becoming the dominant one. Reconnaissance aircraft refuted this however, and fixed the primary center approximately 200 nm (370 km) east of the satellite positions. At 0943Z aircraft observed 38 kt (20 m/sec) winds at 700 mb and estimated surface winds at 25 kt (13 m/sec). Satellite data an hour later showed that convection in the area had, in fact, consolidated around the aircraft-fixed circulation center, and the first warning on Tropical Depression (TD) number 05 was issued at 1200Z.

By the evening of the 16th, TD 05 had accelerated to 17 kt (31 km/hr), and satellite data illustrated increased organization. At 1800Z the depression was upgraded to Tropical Storm Sarah, while located 30 nm (56 km) east of the Philippine island of Samar. During the subsequent 24 hours, Sarah, possessing 40 kt (21 m/sec) intensity, moved toward Manila at 13 kt (24 km/hr) on a west-northwest to northwest heading (Fig. 4-1). At 2355Z on the 17th, Clark AB observed a minimum sea level pressure of 997.3 mb; winds were from the northwest at 12 kt (6 m/sec). Within two hours winds at the Air Base had become southerly. Synoptic reports were of great value during this period. The mountainous terrain prevented aircraft reconnaissance of the low level circulation center, while frictional effects weakened and disorganized Sarah making satellite positioning very difficult.

From the evening of the 16th until the morning of the 20th upper level patterns in Sarah's environment were favorable for enhancement of her upper level outflow, which would normally result in intensification. The Tropical Upper Tropospheric Trough (TUTT) was oriented east-west, north of her and was enhancing outflow in the north semicircle; strongly divergent winds south of the tropical storm increased outflow to the south. While over land, however, Sarah could not intensify since the latent and sensible heat required to maintain sufficient thermal and related pressure gradients were not available. The tropical storm entered the South China Sea on the afternoon of the 18th and immediately began to intensify.

On the evening of the 19th, a mid-tropospheric low over south central China deepened and weakened the subtropical ridge north of Sarah; she responded and turned to the northwest; toward Hainan Island, still intensifying. Sarah was upgraded to a typhoon at 1800Z and six hours later reached its maximum intensity of 75 kt (39 m/sec). At 2100Z Hsi-Sha-Tao (WMO 59981) reported sustained winds (10 minute average) of 60 kt (31 m/sec) from the west-southwest and a sea level pressure of 977.5 mb.

Sarah went ashore on Hainan Island on the evening of the 20th. At 1200Z Ch'iung-Hai (19.3N-110.5E) reported 10 kt (5 m/sec) winds from the west and a sea level pressure of 978.5 mb. At this time Sarah's intensity was estimated to be 70 kt (36 m/sec). Meanwhile, the mid-level low over China had receded toward the north and the subtropical ridge began to build westward, north of Sarah. During the subsequent six hours, the typhoon slowed to 8 kt (15 km/hr) and took a westward course, passing north of the central mountain range of Hainan. At 1800Z Tan-Hsien (19.5N-109.6E) was near the center when it reported 15 kt (8 m/sec) winds from the east-northeast and a sea level pressure of 969.5 mb.

Typhoon Sarah entered the Gulf of Tonkin on the morning of the 21st with an estimated 65 kt (33 m/sec) intensity. The typhoon accelerated to 15 kt (28 km/hr) and went ashore near Haiphong. At 0600Z on the 21st, Kien-an Phulien (20.8N-106.6E), a Haiphong suburb, reported north-northwesterly winds of 30 kt (15 m/sec) and a sea level pressure of 986.9 mb. Six hours later these values had changed to 30 kt (15 m/sec) from the south and 988.5 mb with pressure rising rapidly.

The final warning on Sarah was issued at 1200Z on the 21st as she was dissipating over the Red River Valley, northwest of Hanoi. Very little damage occurred during Sarah's existence. Only Hanoi Radio reported cases of destruction with no casualties.

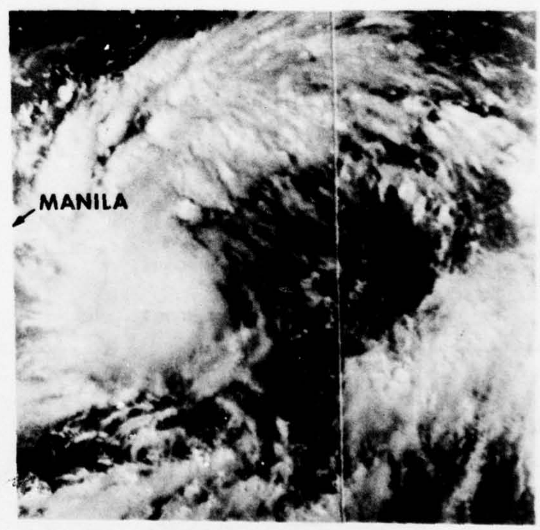
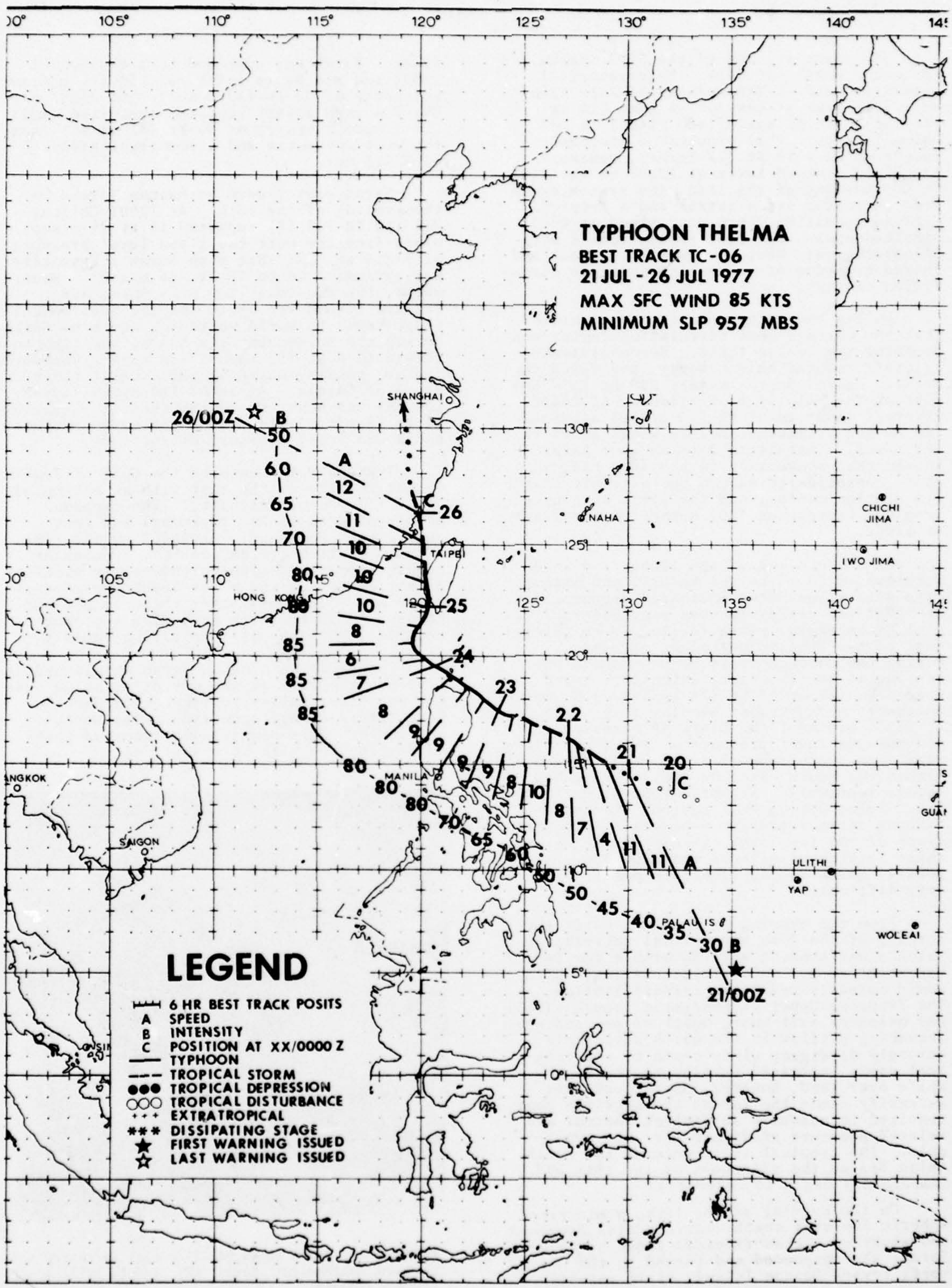


FIGURE 4-1. Sarah at 40 kt (21 m/sec) intensity crossing northeastern Samar, RP, 17 July 1977, 0057Z. (NOAA-5 imagery)


TYPHOON THELMA
BEST TRACK TC-06
21 JUL - 26 JUL 1977
MAX SFC WIND 85 KTS
MINIMUM SLP 957 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
26/00Z
21/00Z
SHANGHAI
TAIPEI
HONG KONG
MANILA
SAIGON
NAHA
CHICHI JIMA
IWO JIMA
ULITHI
YAP
PALAU IS
WOLEAI

Thelma, the second typhoon of the 1977 season, wrought more destruction on Taiwan than any event since World War II. While Typhoon Sarah was still crossing the South China Sea, Thelma was detected by satellite on the morning of July 20th as a tropical disturbance in the central Philippine Sea. The disturbance continued to organize during the subsequent 24 hours, and the first warning was issued on TD 06 at 0000Z on the 21st.

Reconnaissance aircraft at 0918Z on the 21st found flight level winds of 55 kt (28 m/sec), a central pressure of 993 mb, and surface winds estimated at 50 kt (26 m/sec). Based on the aircraft data and corroborating satellite data, TD 06 was upgraded to Tropical Storm Thelma at 1200Z. During the following 30 hours, Thelma continued to intensify at a rate of 5 kt (2.6 m/sec) per 6 hours. At 2050Z on the 22nd, aircraft fixed the tropical storm 255 nm (472 km) northeast of Manila, and observed 60 kt (31 m/sec) winds at its 700 mb flight level. The aircraft further indicated that the central pressure had fallen to 965 mb. As a result of those observations, the system was upgraded to Typhoon Thelma at 0000Z on the 23rd.

The trigger for Thelma's intensification was nearly identical to that of Sarah's a week earlier. Highly efficient outflow channels were provided Thelma by intense cyclonic cells in the TUTT, to the north, and by strongly divergent upper level northeasterlies over Indonesia and the South China Sea, to the south. This situation lasted from the 21st to the 24th when the TUTT receded northward, and Thelma ceased her intensification.

The typhoon continued to move northwestward at 9 kt (17 km/hr) toward the southern periphery of the mid-tropospheric subtropical ridge. On the evening of the 23rd, the storm entered the Bashi Channel, passing 10 nm (19 km) northeast of Escarpada Point on northeastern Luzon. At this time the Kakuho Maru reported 80 kt (41 m/sec) winds and 20 ft (6 m) seas just northwest of the center.

Since the time of Thelma's development, the mid-tropospheric subtropical ridge had been intense over the western Pacific and extended well into China. By 1200Z on the 23rd, geopotential heights at the 500 mb level began to fall over northern China as a low developed over eastern Monogolia and deepened rapidly. On the morning of the 24th, the subtropical ridge north of the tropical system showed signs of weakening.

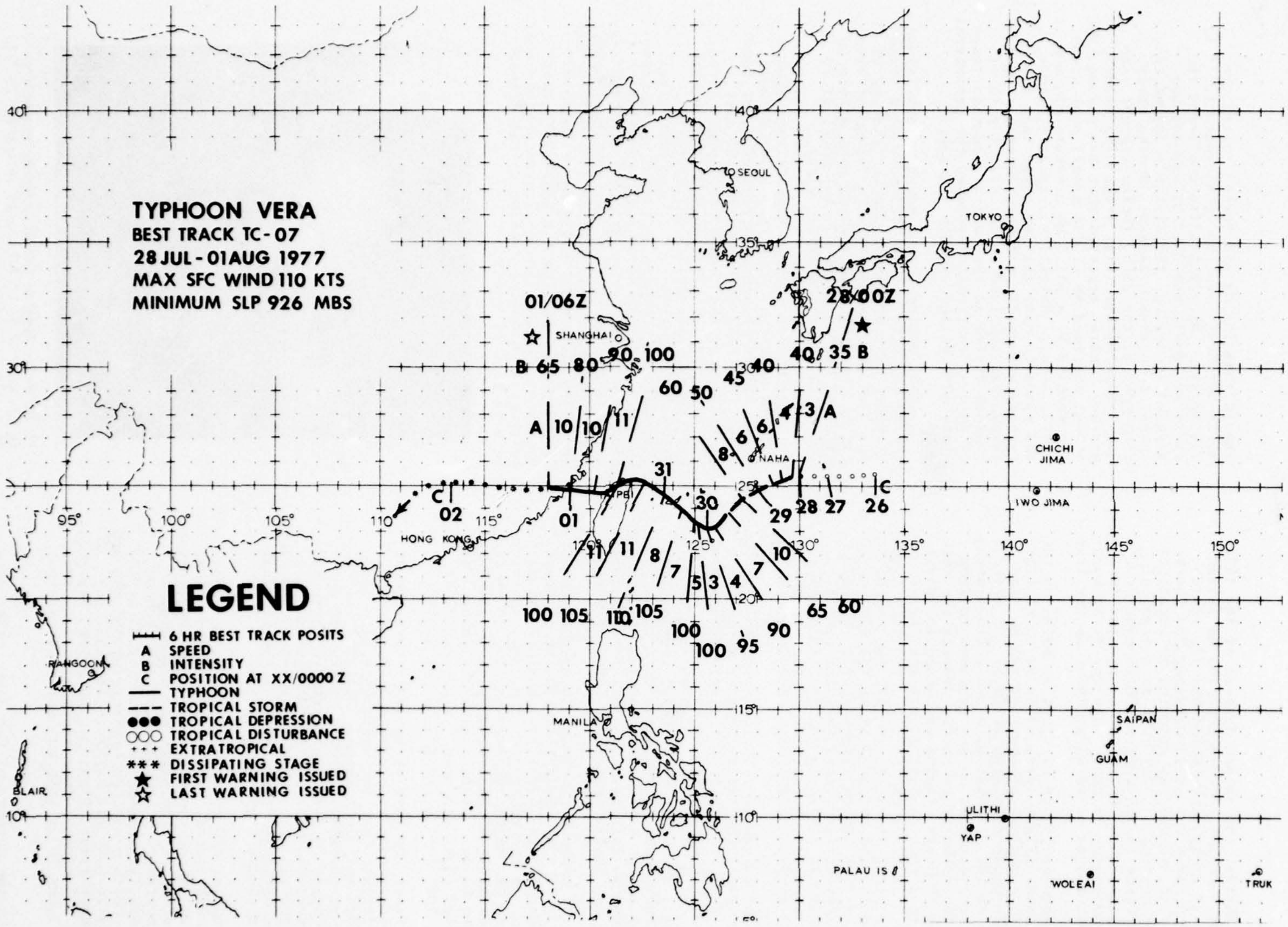
During the evening of the 24th, reconnaissance aircraft positioned Thelma 145 nm (269 km) south-southwest of Kao-hsiung, which indicated that the storm was beginning to move northward. At this time the typhoon attained its maximum intensity of 85 kt (44 m/sec) with a minimum pressure of 957 mb, and slowed to 6 kt (11 km/hr). At 1800Z the passenger liner, President McKinley, reported 45 kt (23 m/sec) winds and 20 ft (6 m) seas while some 70 nm (130 km) northeast of the eye.

On the morning of the 25th, radar data showed that Thelma had turned toward the north-northeast and had accelerated to 10 kt (19 km/hr). When satellite confirmed the radar movement, the 241800Z warning was amended to reflect the system's impending threat to southern Taiwan. During early afternoon of the 25th, Thelma crashed into Kao-hsiung harbor (Fig. 4-2). The Chinese Weather Central reported that Kao-hsiung (WMO 46744) observed 86 kt (44 m/sec) peak winds accompanied by a 991.5 mb pressure minimum at 250939 local. Satellite, aircraft, radar, and synoptic data all indicated that the typhoon was small, but very intense. Most damage was confined to the direct path of Typhoon Thelma as the central mountain range of Taiwan drastically weakened the peripheral winds east of the typhoon's track.

After moving across southwestern-Taiwan, Thelma began to weaken, and move on a track slightly west of north. On the evening of the 25th, Thelma entered the Taiwan Straits, and on the following morning went ashore on mainland China, 30 nm (56 km) north of Fu-Chou with 50 kt (26 m/sec) winds.

During her rampage over Taiwan, Thelma claimed more than 30 lives, injured thousands, and rendered an estimated 5,000 homeless. The typhoon ripped down 53 steel towers supporting high-tension power lines. The loss of power shut down more than one-half of the island's 45,000 factories. Taiwan's largest harbor at Kao-hsiung was virtually destroyed. All eight giant cranes used to load and unload cargo were badly damaged or destroyed. At least 17 ships capsized in the harbor. In her few short hours over southern Taiwan, Thelma left destruction amounting to several millions of dollars (U.S.). According to the Central Weather Bureau of Taiwan, Typhoon Thelma was the most destructive tropical cyclone to hit Taiwan in more than 80 years.

FIGURE 4-2. Typhoon Thelma entering southwestern Taiwan with an 80 kt (41 m/sec) intensity, 25 July 1977, 0243Z. (DMSP imagery)


TYPHOON VERA
BEST TRACK TC-07
28 JUL-01AUG 1977
MAX SFC WIND 110 KTS
MINIMUM SLP 926 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
01/06Z
28/00Z
SEOUL
TOKYO
SHANGHAI
NAHA
HONG KONG
MANILA
RANGOON
BLAIR
CHICHI JIMA
IWO JIMA
SAIPAN
GUAM
ULITHI
YAP
PALAU IS
WOLEAI
TRUK

A tropical disturbance, north of the climatologically favored area, was first evident on satellite imagery and JTWC's synoptic gradient level analysis at 260000Z July 77 with a cyclonic surface circulation center near 25.5N-133.6E. Exhibiting westward movement over the next 24 hour period, the disturbance gained organization and potential for significant development. At 270500Z, a formation alert was issued. By 271800Z the surface circulation reflected 30 kt (15 m/sec) of wind at the surface and JTWC's initial warning on the system as Tropical Depression 07 (TD 07) was issued at 280000Z. Subsequent post-storm analysis revealed that TD 07 had reached 35 kt (18 m/sec) intensity (minimum tropical storm intensity) by initial warning time.

Beginning as far back as 220000Z, a low cell imbedded in a tropical upper tropospheric trough (TUTT) had formed to the northeast of TD 07's initial warning position. Tracking west-southwest, this upper cell was centered near 30.5N-131.0E at 260000Z. The TUTT, now nearly east-west oriented, continued to dig toward the west and at the same time an upper level anticyclone over Korea/Japan north of this TUTT built eastward. The 200 mb winds at stations along the east coast of Japan reflected 60-75 kt (31-39 m/sec) out of the north-northeast. By 271200Z the TUTT cell was centered near 27.8N 133.5E with strong difluence southeast of the cell located over the surface disturbance (Fig. 4-3). The vertical coupling had thus been effected and the necessary conditions for tropical cyclone development fulfilled.

By 280000Z, then, TD 07 was upgraded to a tropical storm and named Vera. A generally westward track (260°) at 3 kt (5.6 km/hr) was observed. Steering at this point seemed to be governed by the easterly flow on the southern periphery of the major anticyclone over Korea/Japan. The TUTT low also moved westward. By 291200Z the anticyclone over Korea/Japan began to build toward the southwest in advance of Vera. Therefore, steering influences were reflected in the observed west-southwest (becoming southwest) track that Vera assumed. As she proceeded southwestward, Vera continued to intensify attaining 65 kt (34 m/sec) by 291200Z. From 291200Z to 291800Z Vera intensified from 65 to 90 kt (34 to 46 m/sec) proceeding to the southwest at 9 kt (17 km/hr). Beyond 291800Z a marked decrease in forward speed was noted (from 9 to 4 kt [17 to 7.4 km/hr]) as the northeasterly steering at upper levels appeared to relax. Simultaneously, an increase in intensity occurred. By 300600Z Vera had attained winds of 100 kt (52 m/sec) and satellite imagery revealed a well-defined eye (Fig. 4-4) while reconnaissance aircraft reported 100 kt (52 m/sec) at the 700 mb flight level. By 301200Z satellite data showed improved outflow channels aloft to the west and north and fix positions from radar, satellite, and aircraft supported a more west-northwestward track.

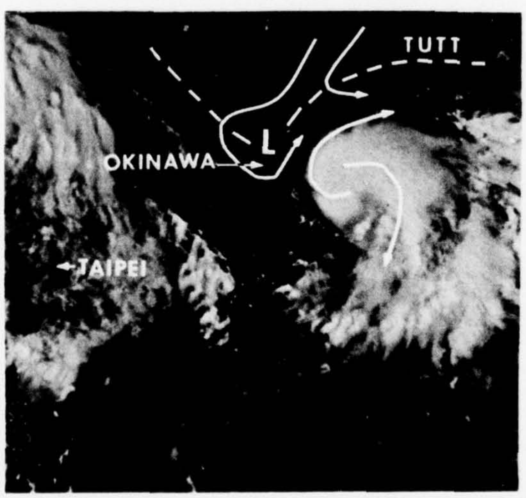


FIGURE 4-3. *Vera at barely 40 kt (21 m/sec) intensity showing strong difluence aloft to the southeast of a TUTT low, 28 July 1977, 0039Z. (NOAA-5 imagery)*

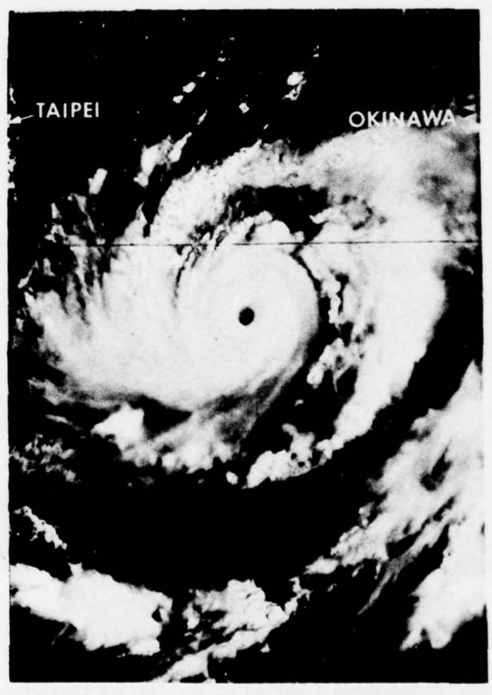


FIGURE 4-4. *Typhoon Vera 200 nm (370 km) east of Taiwan and accelerating northwestward.*

Upon making her turn to the west-northwest, it became evident that Vera would likely pass directly over Iriomote-Jima and just to the south of Ishigaki-Jima. Figure 4-5 shows the one-hourly surface reports from Ishigaki-Jima (WMO 47978) and indicates eye passage south of the island between 302100Z and 302200Z. Maximum winds reported were from the southeast at 103 kt (53 m/sec) at 302200Z (Fig. 4-6). Minimum pressure reported was 935.6 mb at 302100Z. As Vera passed south of Ishigaki-Jima, her speed had increased to 10 kt (19 km/hr). Post-analysis revealed that Vera attained her maximum intensity of 110 kt (57 m/sec) by 310000Z (Fig. 4-7) and decreased in intensity slowly thereafter as she approached Taiwan at a speed of 11 kt (20 km/hr) (Fig. 4-8). Aircraft reconnaissance at 310850Z verified a slight intensity decrease as low level inflow channels were restricted by the island of Taiwan.

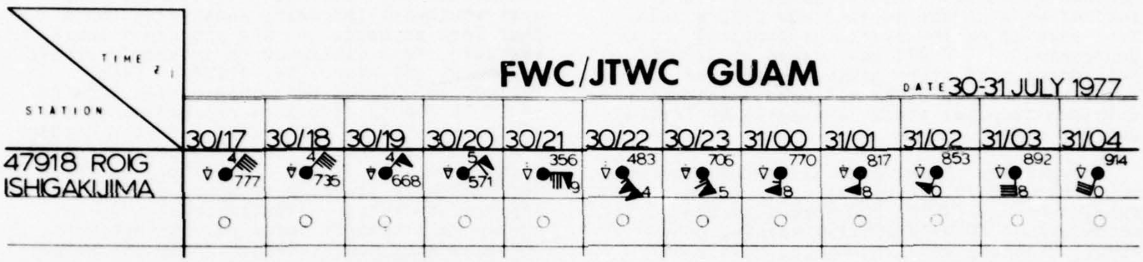


FIGURE 4-5. *Hourly surface synoptic observations from Ishigaki-Jima during passage of Typhoon Vera.*

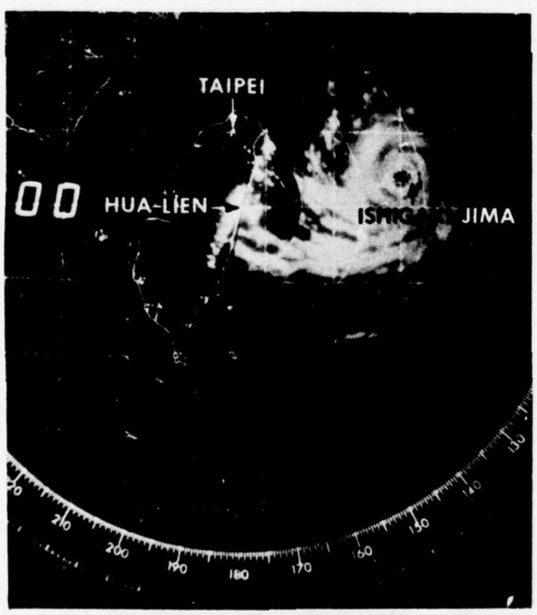


FIGURE 4-6. *Hua-Lien radar presentation of Typhoon Vera when Ishigaki-Jima was receiving maximum sustained winds of 103 kt (53 m/sec), 30 July 1977, 2200Z. (Photograph courtesy of the Central Weather Bureau, Taipei, Taiwan, Republic of China.)*

FIGURE 4-7. *Typhoon Vera at maximum 110 kt (57 m/sec) intensity and just 19 minutes after the radar imagery in Figure 4-6, 30 July 1977, 2219Z. (DMSP imagery)*

Landfall on the island of Taiwan occurred at Keelung (Chi-Lung) at the mouth of the Chi-Lung Ho River basin. Moving at 11 kt (20 km/hr) Vera followed the river basin to the west-southwest toward Taipei. Keelung recorded a minimum low pressure of 939.9 mb at 310930Z and a total rainfall of 7.95 in (202 mm). Maximum winds recorded at the Chinese Weather Bureau office in downtown Keelung were 66.6 kt (34 m/sec) with gusts to 113 kt (58 m/sec) at 311030Z. In Taipei, a minimum pressure of 951.5 mb was recorded at 311028Z with total rainfall recorded as 8.0 in (203 mm). Taipei International Airport reported maximum winds of 64 kt (33 m/sec) with gusts to 96 kt (49 m/sec). Both Keelung and Taipei established new records in observed maximum wind reports with Vera's passage. After passing over the northeastern part of Taipei city, Vera continued on a nearly westward track and emerged in the Taiwan Straits just north of Hsin Chu at 311500Z. Vera continued on a westward track at 11 kt (20 km/hr) and made landfall on the China mainland near Ch'uan-Chou at 010100Z August with an intensity of 80 kt (41 m/sec).

Following so closely after Typhoon Thelma, which had wreaked havoc on the southern portion of Taiwan, Typhoon Vera left at least 25 dead in her wake and vast amounts of property and crop damage. Two ships sank, 10 went aground, 3 were washed away, and 22 were damaged. However, with timely warnings and the occurrence of Thelma two weeks prior, most ships diverted and rode out the storm in the safety of the open sea.

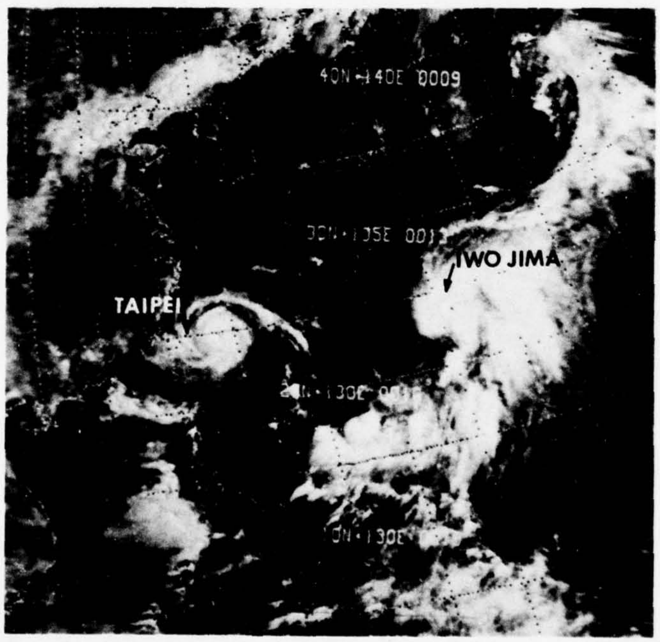
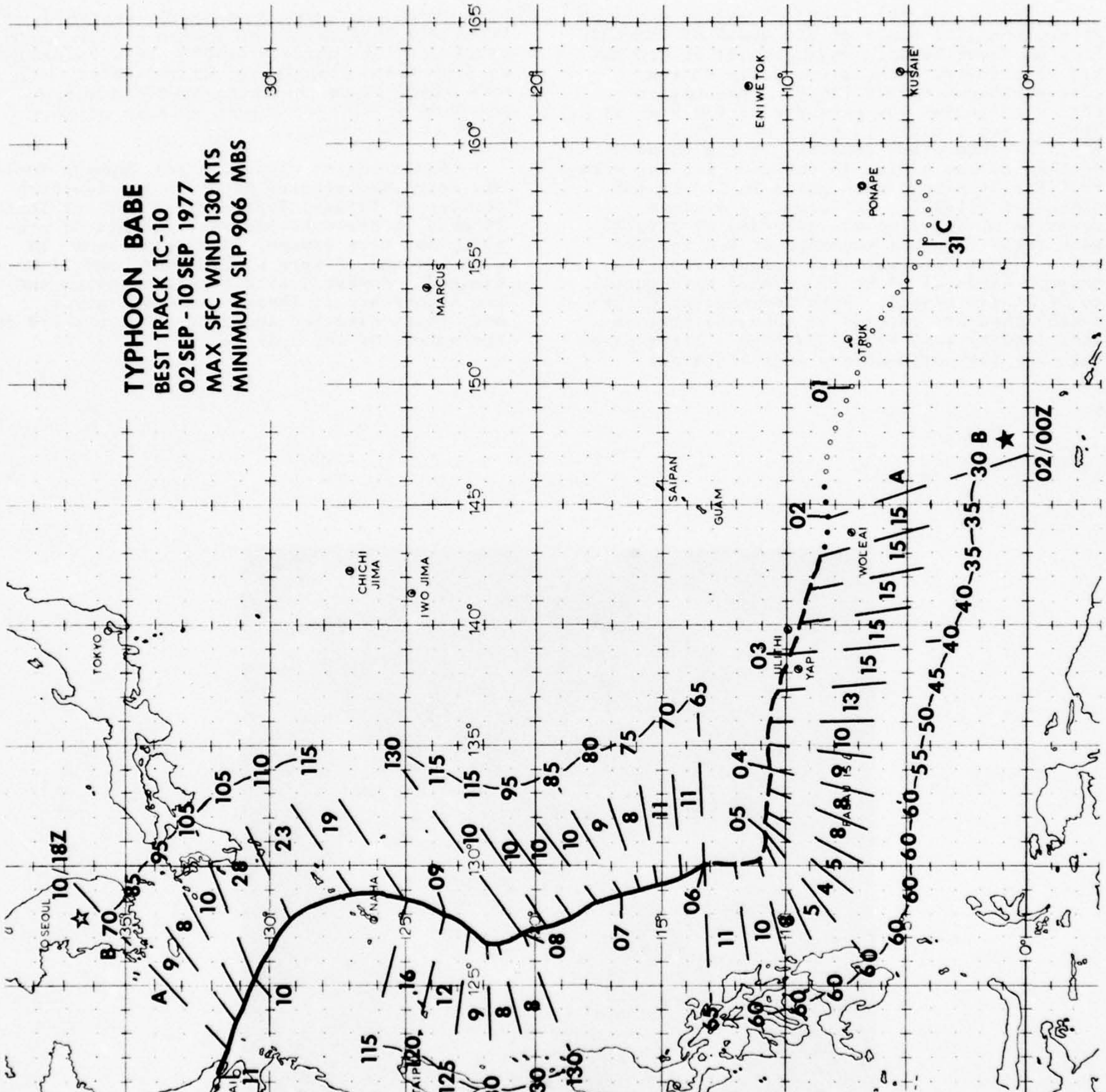


FIGURE 4-8. Typhoon Vera approaching northern Taiwan, 30 July 1977, 2352Z. The next cyclone, Tropical Storm Wanda, is shown at development stage with 30 kt (15 m/sec) winds 100 nm (185 km) south of Iwo-Jima. (NOAA-5 imagery from FLEWEAFAC Suitland, MD)


TYPHOON BABE
BEST TRACK TC-10
02 SEP - 10 SEP 1977
MAX SFC WIND 130 KTS
MINIMUM SLP 906 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TOKYO
SEOUL
SHANGHAI
HONG KONG
SAIGON
MANILA
TAIPEI
NAHA
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
GUAM
ULITHI
YAP
WOLEAI
TRUK
PONAPE
KUSAIE
ENIWETOK
10/18Z
02/00Z

During August 1977, no typhoons were observed. The JTWC significant Tropical Weather Advisory of 31 August stated, "the probability is that the remainder of 1977 should see an increase in typhoon activity". The next day, 1 September, the seedling of the year's 10th tropical cyclone and the only super typhoon was first observed. Babe was a very challenging storm in that during her lifetime she threatened virtually every major DoD facility in the western North Pacific.

Satellite data on the 1st at 0143Z and 0000Z synoptic data indicated a weak surface circulation with associated convection near 7N-150E. Based on this data, a Tropical Cyclone Formation Alert was issued. At this time, there was a tropical upper tropospheric trough (TUTT) present at 200 mb to the North of the alert area. The TUTT maintained its position through the 3rd at 0000Z and the divergence on the southern side of the TUTT aided in the development of the seedling into Tropical Depression 10 (TD 10).

The first warning on TD 10 was issued on the 2nd at 0000Z. An aircraft fix on the 2nd at 0052Z estimated the maximum surface wind to be 40 kt (21 m/sec). On the following warning (0600Z), TD 10 was upgraded to Tropical Storm Babe. With the TUTT circulation providing fair outflow conditions aloft, Babe slowly intensified as she moved westward across the warm Philippine Sea. Babe was being steered at this time by a well developed mid-tropospheric subtropical ridge which extended from the dateline into central China. With this westward movement expected to continue, Babe was forecast to cross the Republic of the Philippines and pose a threat to Subic Bay and Clark AB. The westward movement continued until the 5th at 0000Z when signs of a change in direction of movement first appeared. Between the 2nd and the 4th, Babe had an average speed of 14 kt (25 km/hr). By the 4th at 1200Z, the speed had dropped to 8 kt (14 km/hr), further dropping to 5 kt (9 km/hr) in the following 12 hours.

On the 5th at 0000Z, an upper air trough in the mid-latitude westerlies appeared over northeastern Asia. A weakness in the subtropical ridge between the trough and Babe became evident and increased the probability of a more northerly storm track. A change in Babe's direction of movement was first noted by satellite data at 052155Z (Fig. 4-9) and confirmed by aircraft reconnaissance at 052243Z.

Taiwan, which was still recovering from the effects of earlier typhoons, Thelma and Vera, was now threatened again. Aircraft data between the 5th at 0832Z and the 7th at 2204Z showed Babe to have undergone rapid deepening with the central pressure dropping from 988 mb to 907 mb, a rate of 1.3 mb/hr. This rapid deepening was in response to the divergent southwesterly flow ahead of the strong upper air trough now stretching from east of Japan into central Taiwan, which provided a strong outflow channel aloft. Babe was upgraded to a typhoon on the 6th at 0000Z and a super typhoon on the 8th at 0000Z (Fig. 4-10).

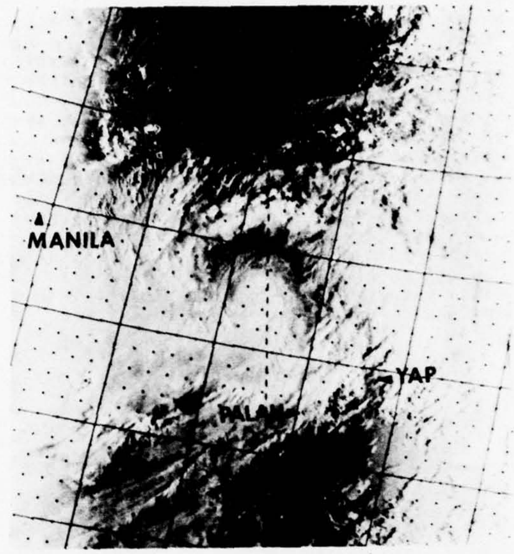


FIGURE 4-9. *Babe at minimal typhoon strength and heading northward, 5 September 1977, 2155Z. (DMSP imagery)*

FIGURE 4-10. *Super Typhoon Babe at 130 kt (67 m/sec) intensity 250 nm (463 km) southeast of Ishigaki Jima, 8 September 1977, 0303Z. (DMSP imagery)*

Up until the 080000Z warning, Babe was still forecast to cross Taiwan and then dissipate in mainland China prior to full recurvature. On the 7th at 1200Z, however, another upper air trough moved into northern China. This short wave additionally weakened the mid-tropospheric ridge over southeastern China. A low soon developed in this trough over Korea indicating the trough would move slowly and possibly deepen. This increased the probability that Babe would recurve much earlier than expected. This came to pass and as Taiwan was relieved, Okinawa and Japan now faced the fury of Babe. Aircraft and radar data showed Babe began recurvature to the northeast after the 8th at 0600Z and while weakening at a rate of 5 kt/6 hr (2.5 m/sec). Conditions of readiness were set for southern Japan and aircraft evacuated Kadena AB for appropriate "safe haven" locations (Fig. 4-11).

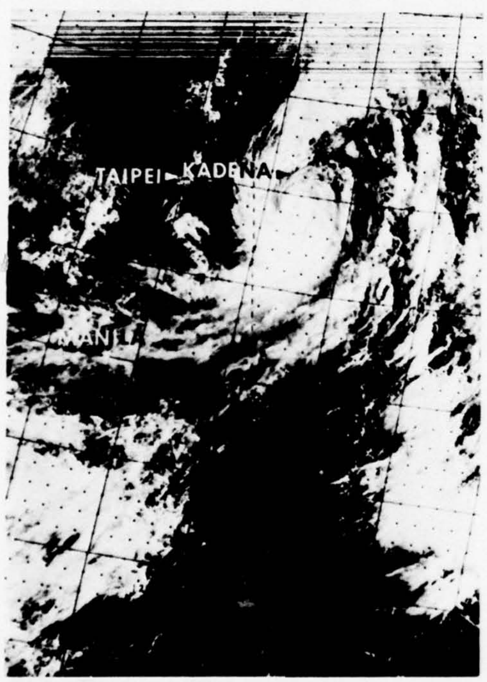


FIGURE 4-11. Typhoon Babe at 120 kt (62 m/sec) intensity, slowly weakening and accelerating northward, 9 September 1977, 0245Z. (DMSP imagery)

During Babe's north-northeastward transit, the upper air low which had formed over Korea moved south-southwestward, deepened and cut-off from the main upper air trough. This allowed ridging to the east and northeast of Babe to build east-west to the north of Babe and the cut-off low steering Babe toward Korea, and eventually Shanghai. Evidence of a Fujiwhara type effect between Babe's circulation and the cut-off low also appeared. Babe finally steered around the northern periphery of the cut-off low and hit the People's Republic of China just north of Shanghai on the 11th at 0000Z with surface winds of 65 kt (33 m/sec) (Fig. 4-12).

The greatest damage from super typhoon Babe occurred after she recurved and headed for Japan. Newspaper reports described Babe as "the worst typhoon to threaten Japan in 18 years". Babe struck the Japanese island of Okino-Erabu with winds of 135 kts (69 m/sec) injuring 45 people and destroying 1600 homes. Kadena AB recorded maximum sustained winds of 36 kt (19 m/sec) on the 9th and a peak gust of 60 kt (31 m/sec) at 091328Z. Babe also disrupted maritime activities sinking a Panamanian freighter with 16 reported dead or missing and damaging approximately 100 Japanese fishing vessels which sought safety in the East China Sea.

The overall forecast accuracy for super typhoon Babe was below average. However, the DoD operational impact was decreased by the use of forecast confidence probabilities appended to JTWC prognostic discussion bulletins and the many telephone conversations between JTWC and WESTPAC staff meteorologists. This was confirmed by operations staff personnel at the 1978 Tropical Cyclone Conference.

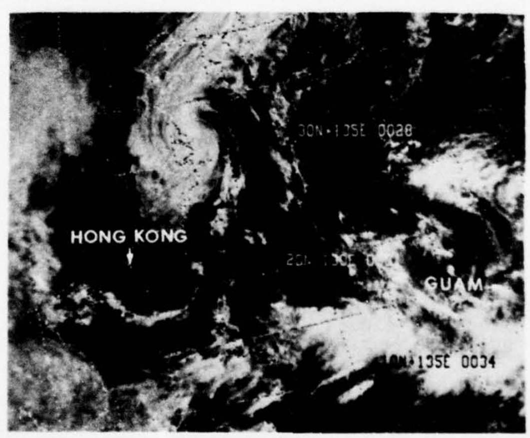
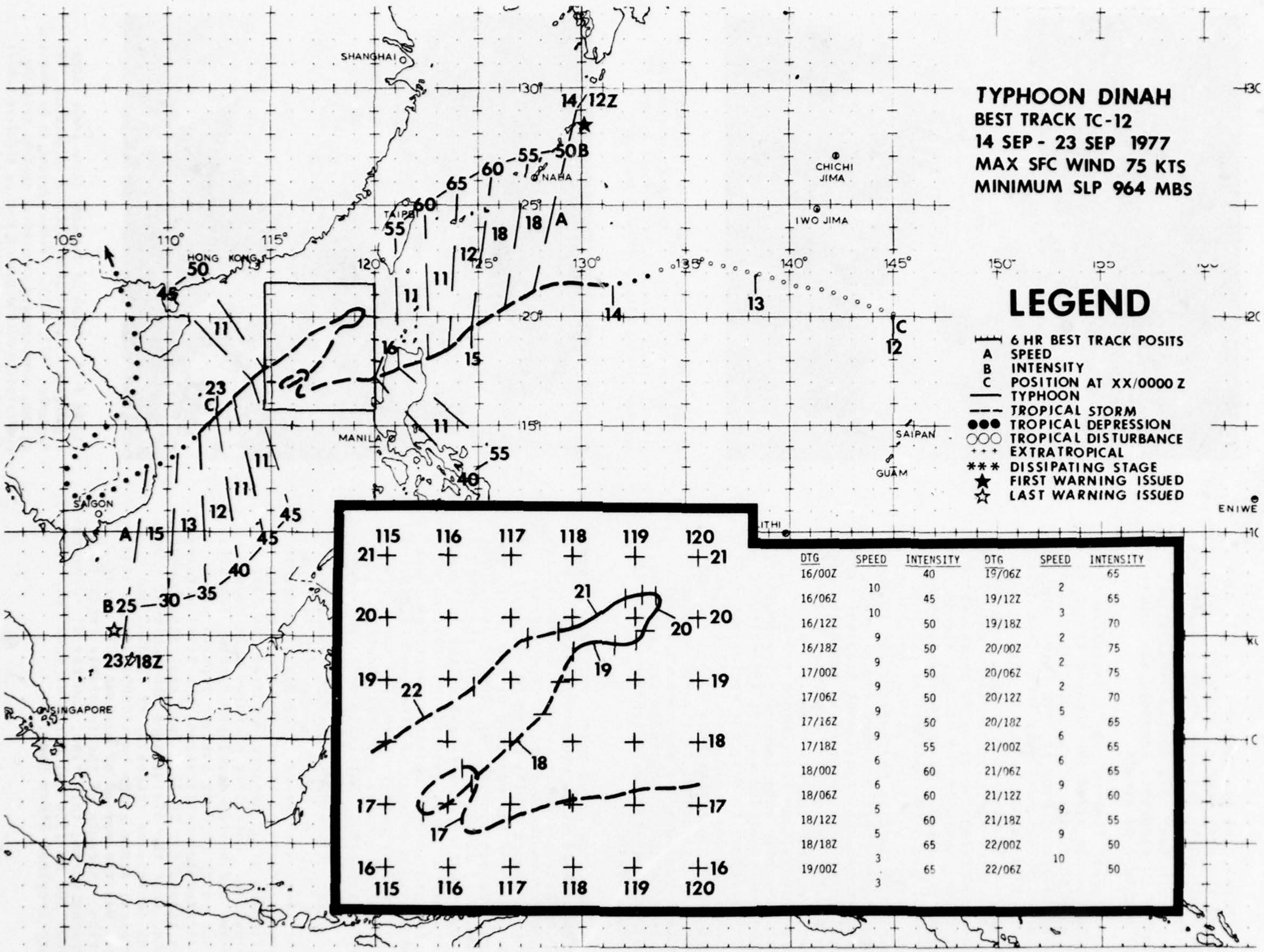


FIGURE 4-12. Typhoon Babe during landfall 60 nm (111 km) north of Shanghai, People's Republic of China, 11 September 1977, 0109Z. The monsoon trough extending from the Philippine to the Mariana Islands would soon spawn the next typhoon, Dinah. (NOAA-5 imagery from FLEWEAFAC Suitland, MD)



DTG	SPEED	INTENSITY	DTG	SPEED	INTENSITY
16/00Z	10	40	19/06Z	2	65
16/06Z	10	45	19/12Z	3	65
16/12Z	9	50	19/18Z	2	70
16/18Z	9	50	20/00Z	2	75
17/00Z	9	50	20/06Z	2	75
17/06Z	9	50	20/12Z	5	70
17/16Z	9	50	20/18Z	6	65
17/18Z	6	55	21/00Z	6	65
18/00Z	6	60	21/06Z	9	65
18/06Z	5	60	21/12Z	9	60
18/12Z	5	60	21/18Z	9	55
18/18Z	3	65	22/00Z	10	50
19/00Z	3	65	22/06Z		50

Dinah, the 5th typhoon of 1977, displayed the most unusual behavior. While over the South China Sea, the storm executed two hairpin turns and one loop before meandering over South East Asia during dissipation. Dinah's development, however, was a more normal sequence of events.

"Super" Typhoon Babe's extensive circulation system aided the monsoon trough to move north of its normal location. After Babe dissipated over eastern China, the monsoon trough extended from South East Asia to the Mariana Islands along 20 degrees north latitude. South of the trough, deep southwesterly flow produced localized gale force winds and extensive areas of thundershower activity. North of the trough, steady easterlies prevailed. Although the opposing currents produced considerable cyclonic shear and relative vorticity within the trough, the counter productive northeasterlies in the upper troposphere produced enough vertical shear to prevent significant tropical cyclone development. Meteorological satellite data during this 2nd week of September period showed several loosely organized areas of convection within the monsoon trough. On the 12th, synoptic data located a low level circulation center 400 nm (741 km) north of Guam. Maximum intensity near the center was estimated to be 20 kt (10 m/sec) while localized gale force winds continued within the southwest monsoon current to the southern and eastern periphery of the monsoon trough. (Islanders in the southwest flow could not believe there was not a tropical storm or typhoon nearby.)

The circulation center initially moved northwestward at an average speed of 16 kt (30 km/hr). Synoptic reports and satellite imagery revealed a tropical upper-tropospheric trough (TUTT) oriented east-west and just north of the position of the low to mid-level monsoon trough. By 1200Z on the 12th, a westward moving cyclone within the TUTT became positioned northeast of the surface disturbance. This orientation relieved much of the previously inhibiting vertical shear and provided an area of divergence aloft. This new flow pattern permitted the surface disturbance greater vertical growth and intensification. Satellite data soon identified a distinct vortex which separated from the areas of southwest monsoon cloudiness (Fig. 4-13). At 0100Z on the 14th, a formation alert was issued. The disturbance now moved westward as it entered the steering influence of an anticyclone over the East China Sea. Satellite pictures soon showed larger and better developed banding features. Since corresponding surface reports also indicated intensification, the first warning was issued for TD 12. Post analysis, however, found that the disturbance had achieved tropical depression intensity by 131800Z and tropical storm stage by 140000Z (Fig. 4-14). This was the period of maximum TUTT interaction. Because of the favorable conditions present during this time, another disturbance about 300 nm (556 km) north of Guam developed into Tropical Storm Emma.

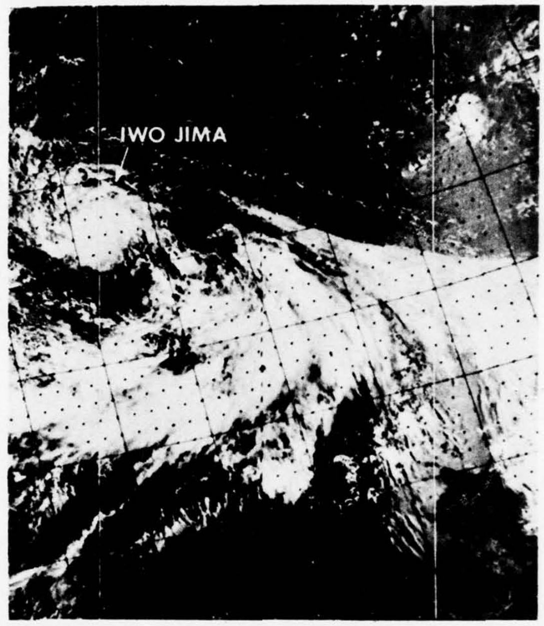


FIGURE 4-13. *Tropical Depression 12 (Dinah) 225 nm (417 km) southwest of Iwo Jima while breaking away from its place of origin, the monsoon trough, 12 September 1977, 2310Z. (NOAA-5 imagery)*

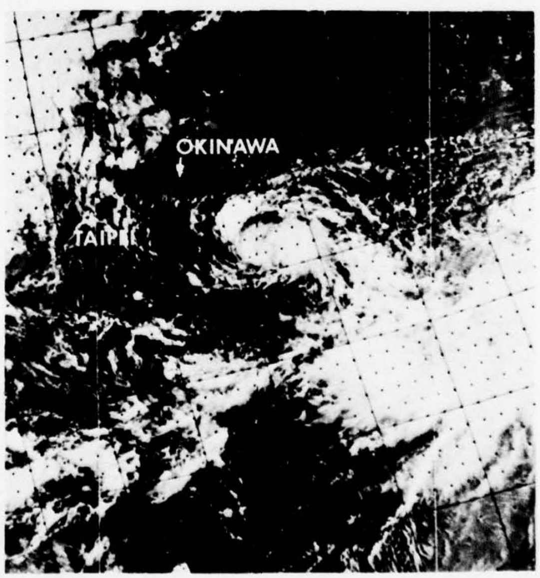


FIGURE 4-14. *Dinah at tropical storm stage intensifying in an interesting split configuration, 14 September 1977, 0023Z. Dinah appears to be composed of two, comma-shaped convective systems rotating cyclonically with a narrow zone of relative subsidence between them. (NOAA-5 imagery)*

As TD 12 grew and became Tropical Storm Dinah, the pressure gradient between the storm and the subtropical ridge increased. The associated easterly steering currents correspondingly increased and accelerated Dinah to a maximum speed of 19 kt (35 km/hr). An intensifying, mid-tropospheric high over eastern China was now the primary source of these easterlies. As this high pressure cell continued to build, Dinah was steered in a southwesterly direction towards the Republic of the Philippines. Forward speed decreased as the gradient slackened. Steady intensification continued as upper level outflow was well established in all quadrants. This trend persisted until Dinah reached minimum typhoon strength at 150600Z just 100 nm (185 km) off northern Luzon. With a maximum intensity of 55 kt (28 m/sec), the storm entered Luzon 35 nm (65 km) south of Escarpada Point at 151500Z. That evening Dinah passed near Tuguegarao, a station in northeastern Luzon which experienced 96 kt (49 m/sec) peak winds and a mean sea-level pressure of 977.0 mb.

Upon entering the South China Sea after 7 hours over land, Dinah weakened to 40 kt (21 m/sec), but quickly reintensified to 50 kt (26 m/sec) winds within 14 hours. Headed west-southwestward, Dinah entered an area of weaker steering currents. The dominating anticyclone over China was beginning to weaken and mid-latitude westerlies began extending southward. By the 17th, the continued weakening of steering currents caused the storm to slow to 9 kt (17 km/hr) movement.

For the next 4 days, Dinah exhibited unusual behavior. The weakening subtropical ridge over China broke down into a series of smaller high cells while the southwest monsoon deepened. Caught between these oscillating and opposing steering sources, Dinah abruptly turned northeast and then executed a loop during the 17th. As the southwest monsoon strengthened and became the dominant steering flow, the storm was directed northeastward toward Taiwan.

Intensification resumed as a result of the enhanced monsoon. The weakening subtropical ridge and increasing outflow aloft also contributed to Dinah's growth. By 181800Z, typhoon strength was again achieved. After being displaced north nearly 150 nm (218 km), movement slowed to 5 kt (9 km/hr) as Dinah's steering flow became less effective. By the 19th an advancing mid-latitude trough over China aided in steering Dinah eastward. Sustained winds of 65 kt (33 m/sec) persisted as satellite imagery at 191201Z revealed an eye. At 200000Z, Dinah reached a short-lived maximum intensity of 75 kt (39 m/sec) (Fig. 4-15). Ever since Dinah's origin, the southwest monsoon was the major feeding current. By 200600Z, this flow was being diverted into the beginnings of Tropical Storm Freda in the Philippine Sea and Dinah began to weaken.

As the mid-latitude trough advanced over China, it did not dig south as forecast and a large high pressure area built in behind it. In response, Dinah did not continue eastward in advance of the trough; it slowed to 2 kt (3.7 km/hr), turned westward, then southwestward being influenced by the intensifying high over China. Dinah was the first storm to be directly affected by an early autumn surge in the northeast monsoon.

The northeasterlies from the strong high over China controlled Dinah's movement for the next 2 days. Diminishing moist southwesterlies and increasing dry northeasterlies steadily weakened the storm. Dinah accelerated southwestward and reached south Vietnam as a weak tropical depression at 231700Z. JTWC's last warning was issued one hour later.

After landfall, Dinah, in its dissipating stage, persisted for 4 days. Tropical Storm Freda and the weakening of the northeast monsoon were the controlling agents in the last days of Dinah's unusual track. After crossing the South China Sea, Freda entered southern China drawing the southwest monsoon northward. Once again embedded in a southwest steering current, TD 12 (Dinah) journeyed northward through Cambodia, northeastward over the Gulf of Tonkin then northward into southern China and finally dissipated.

Dinah's sweep across northern Luzon caused loss of lives and property. Floods and landslides alone caused 15 deaths and 11 missing. Although Dinah remained a safe distance from mainland China while jogging unpredictably over the South China Sea, Hong Kong displayed the Stand By Signal No. 1 for a record 124 hours and 40 minutes.

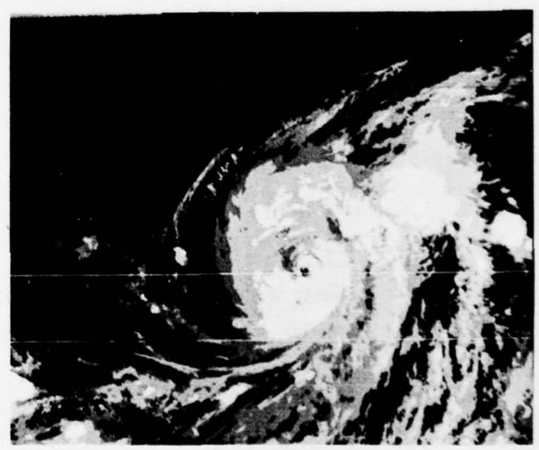
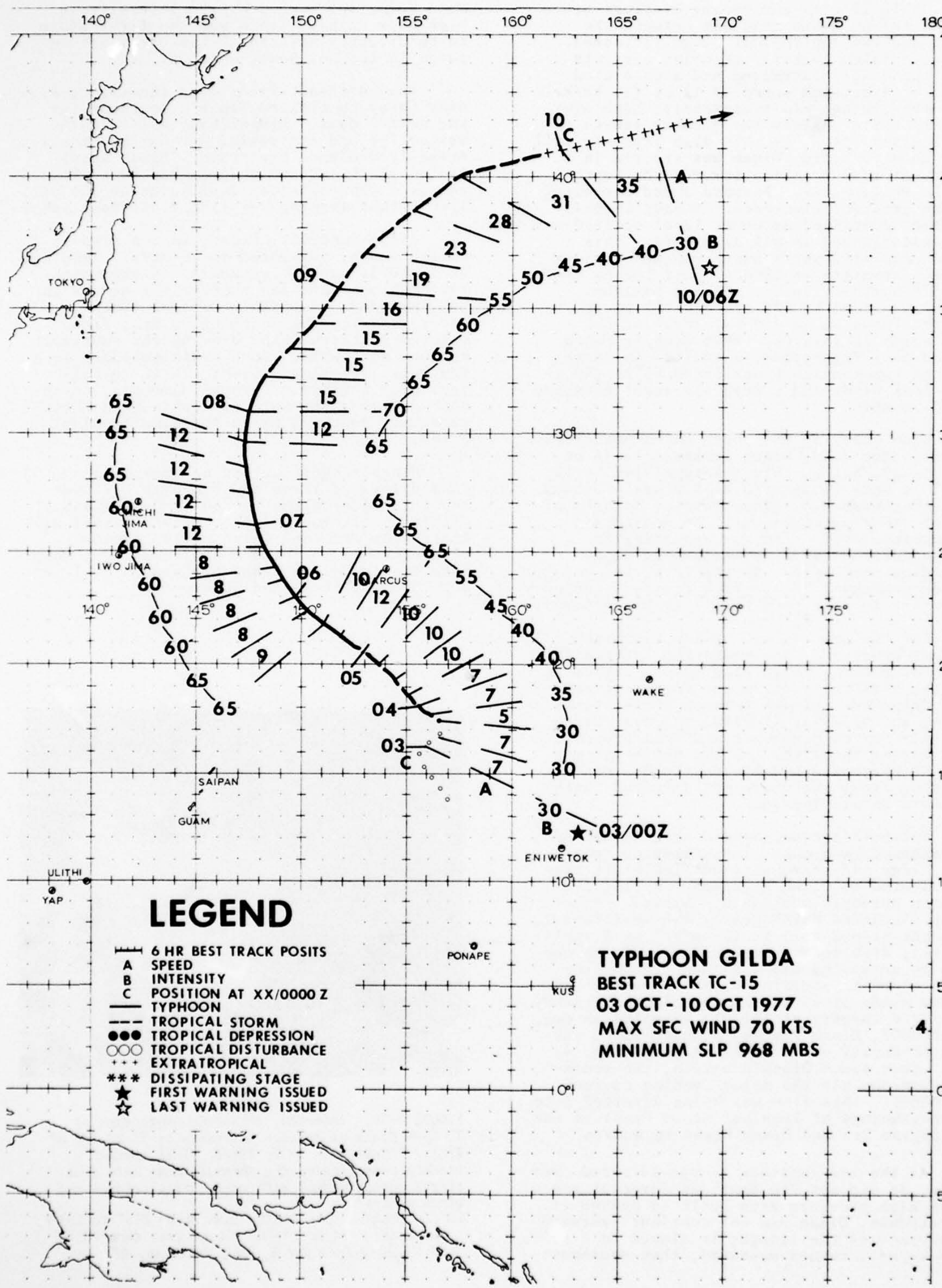


FIGURE 4-15. *Infrared, threshold photograph of Typhoon Dinah at maximum intensity of 75 kt (39 m/sec), 19 September 1977, 2310Z. This special product consolidates the thermal range into four slices (gray shades) with white being coldest and black warmest.*
Black: greater than 253°K; dark gray: 253° to 233°K; light gray: 233° to 213°K; white: less than 213°K. (DMSP imagery from Det 5, 1WW, Clark AB, RP)


140°
145°
150°
155°
160°
165°
170°
175°
180°
45°
40°
35°
30°
25°
20°
15°
10°
5°
0°
TOKYO
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
YAP
ENIWETOK
PONAPE
KUS
03/00Z
10/06Z
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TYPHOON GILDA
BEST TRACK TC-15
03 OCT - 10 OCT 1977
MAX SFC WIND 70 KTS
MINIMUM SLP 968 MBS
4

On the 1st of October, a large area of heavy convection, 300 nm (556 km) in diameter, was detected by satellite approximately 325 nm (600 km) north of Ponape. Synoptic data indicated a weak surface circulation in the vicinity. The system, which would later become Typhoon Gilda, was observed to be moving northward toward a weakness in the mid-tropospheric subtropical ridge.

On the 2nd of October, a Tropical Cyclone Formation Alert was issued as satellite data indicated increased organization and upper level outflow. Further intensification was expected due to the existence of an upper level trough to the northwest.

Aircraft reconnaissance on the morning of the 3rd reported 38 kt (20 m/sec) winds at the 1500 foot (441 m) flight level. Based on this data and the assessed good potential for further intensification, the first warning was issued on TD 15 at 0000Z on the 3rd.

For the next 18 hours the tropical depression moved erratically toward the north at a speed of 5 kt (9.3 km/hr). During the 3rd, the mid-tropospheric subtropical ridge northeast of TD 15 began to build toward the west. Late on the 3rd, TD 15 responded and began to move toward the northwest. Simultaneously, the tropical depression began to interact with a cyclonic cell in the Tropical Upper Tropospheric Trough (TUTT) located to the depression's northwest. Divergent southwesterlies aloft, on the southeast periphery of the upper level cyclonic cell, enhanced the outflow of TD 15 and by 1800Z on the 3rd the system had intensified to tropical storm intensity.

During the 4th, Tropical Storm Gilda continued to intensify as it accelerated to 12 kt (22 km/hr) on its northwestward track. Reconnaissance aircraft on the afternoon of the 5th indicated 80 kt (41 m/sec) winds at its 700 mb flight level, and observed that the central pressure of Gilda had fallen to 974 mb, a 15 mb drop in 11.5 hours. Using this information, Gilda was upgraded to typhoon at 0600Z.

During the past 36 hours, a mid-tropospheric, short wave trough moved eastward from eastern China toward Japan, and began to deepen. By the 5th this trough had moved east of northern Japan, and had dug sufficiently equatorward to sever the subtropical ridge north of Gilda. By the afternoon of the 6th, the typhoon had acquired a north-northwestward track toward the weakness in the ridge. At 0622Z, aircraft reconnaissance showed that the central pressure had risen to 986 mb. Consequently, the 0600Z warning was amended and Gilda was downgraded to a Tropical Storm. The weakening, however, was short lived; 24 hours later she had again attained typhoon intensity. At 1500Z on the 7th Gilda passed through the weakness in the subtropical ridge and shortly thereafter began recurving toward the north-northeast. As frequently observed with October tropical cyclones, Typhoon Gilda continued to intensify after recurvature. She attained her peak intensity of 70 kt (36 m/sec) on the 8th when aircraft at 0325Z reported the typhoon's minimum sea level pressure of 968 mb(Fig. 4-16).

By the night of the 8th, Gilda had again weakened to tropical storm strength, and had taken a northeast heading around the northwestern periphery of the mid-tropospheric high cell. During the subsequent 36 hours, the tropical storm accelerated rapidly toward the east-northeast and weakened at a rate of 5 kt (2.6 m/sec) per 6 hours. On the morning of the 10th, Gilda became extratropical, moving toward the east-northeast at more than 30 kt (55 km/hr).

During her eight day span, the closest point of approach to land was 220 nm (407 km) when she passed southwest of Marcus Island on the evening of October 5th. On the ocean, ships stayed well away from Gilda's strong winds. As a result, Gilda claimed no loss of life or damage to property.

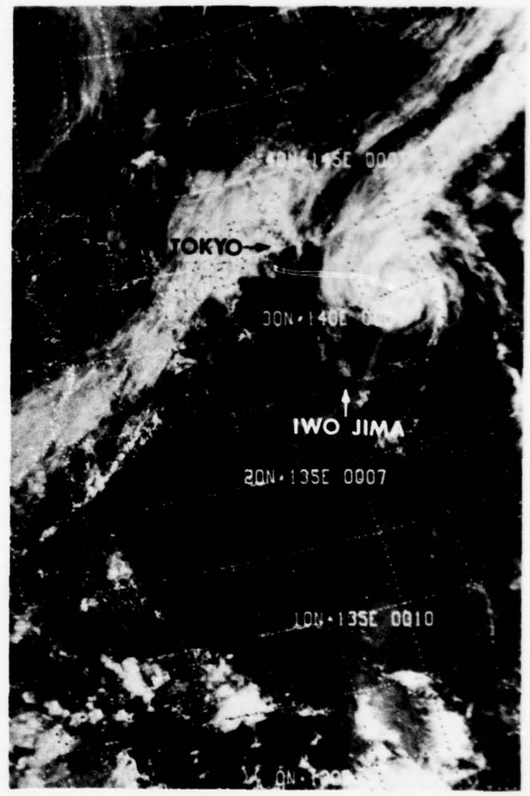
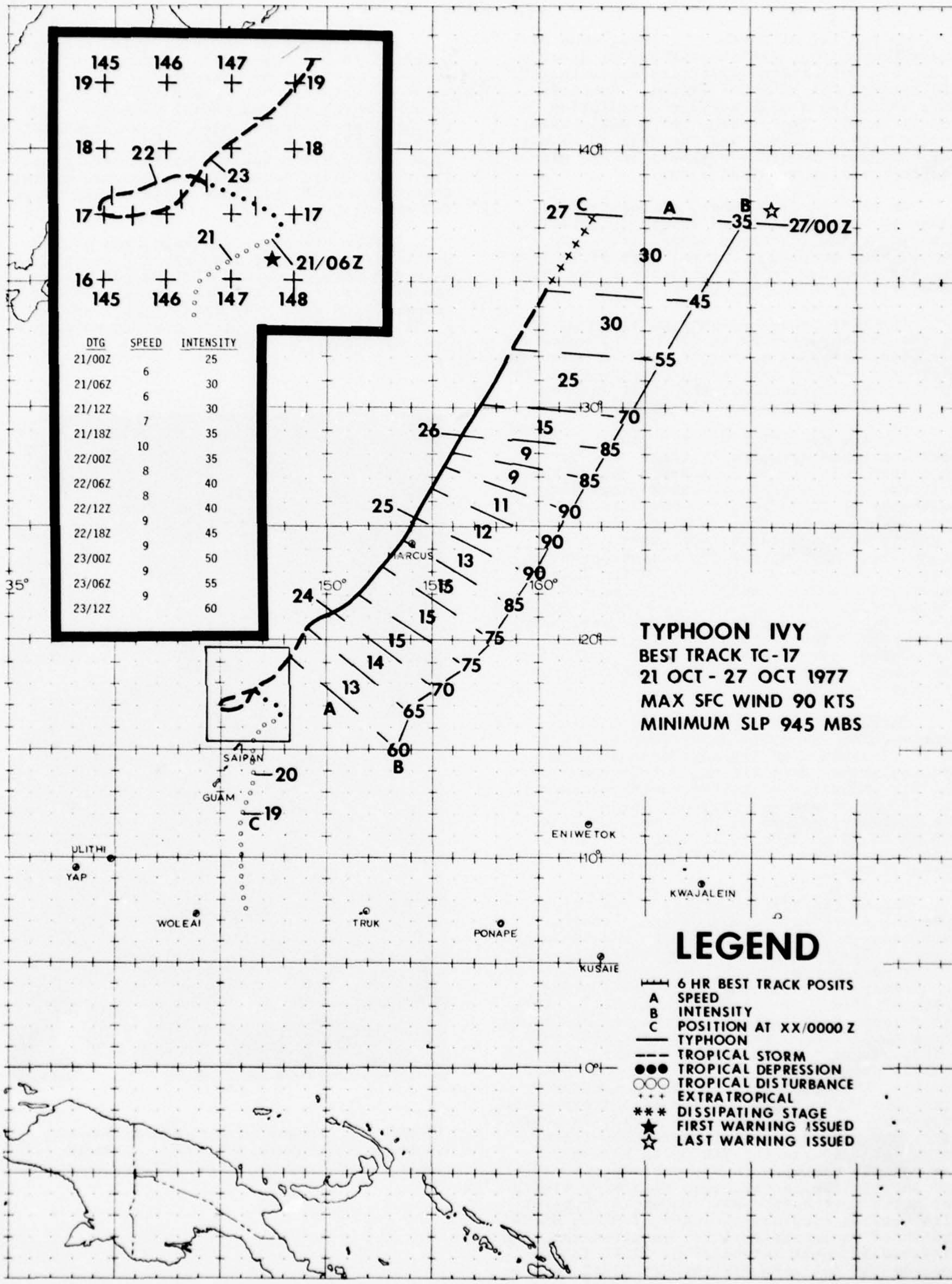


FIGURE 4-16. *Typhoon Gilda at maximum intensity of 70 kt (36 m/sec) during recurvature, 7 October 1977, 2343Z. (NOAA-5 imagery from FLEWEAFAC Suitland, MD)*


145 146 147
19 19
18 22 18
23
17 17
21
21/06Z
16 148
145 146 147 148
DTG SPEED INTENSITY
21/00Z 25
6
21/06Z 30
6
21/12Z 30
7
21/18Z 35
10
22/00Z 35
8
22/06Z 40
8
22/12Z 40
9
22/18Z 45
9
23/00Z 50
9
23/06Z 55
9
23/12Z 60
27 C A B 35 27/00Z
30
45
30
55
25
70
26 15
85
9
9 85
11 90
25
12 90
MARCUS 13
90
24 150° 15 160°
85
15
15 75
14 75
13 70
A 65
60
B
SAIPAN 20
GUAM 19
C
TYPHOON IVY
BEST TRACK TC-17
21 OCT - 27 OCT 1977
MAX SFC WIND 90 KTS
MINIMUM SLP 945 MBS
ENIWETOK
ULITHI
YAP
KWAJALEIN
WOLEAI
TRUK
PONAPE
KUSAIE
35°
140
130
120
110
0°
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED

Ivy, the 7th typhoon of 1977, originated from an easterly wave. It was first detected by synoptic data moving westward over the Marshall Islands on the 14th of October. Within 24 hours it entered an area of increased low level convergence associated with the near equatorial trough (NET), intensified, and developed a surface circulation. For the next 8 days it remained within the NET before breaking loose.

The development of Ivy was also aided by the movement of Tropical Storm Harriet, which was also embedded in the NET. TS Harriet moved northward through the Philippine Sea displacing the NET northward. This northward shift allowed for an increase in favorable conditions for intensification. By the 19th the developing cyclone (Ivy) was receiving most of the low level, southwesterly flow that was previously supplied to the now weakening Harriet (Fig. 4-17). The next day satellite data indicated that the disturbance's convective activity and organization had increased while surface reports indicated that the central pressures were steadily falling. JTWC, therefore, issued a formation alert at 200126Z.

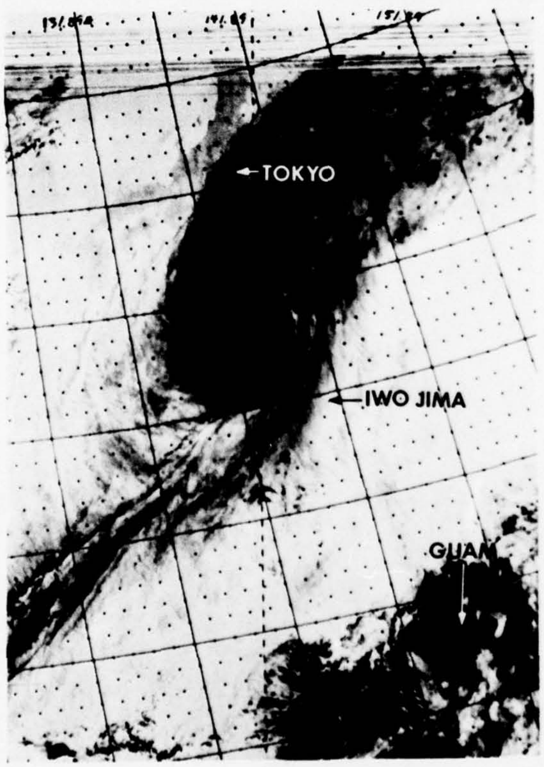


FIGURE 4-17. *Infrared photograph of Ivy in the formative stage near Guam with Tropical Storm Harriet at maximum intensity of 55 kt (28 m/sec), 19 October 1977, 1014Z. (DMSP imagery)*

Upper tropospheric, synoptic data from the morning of the 21st indicated that the outflow pattern above the alert area was continuing to strengthen. An aerial reconnaissance investigation on the afternoon of the 21st detected an organized surface cyclonic circulation with a 996 mb central pressure. Reconnaissance data further indicated that the disturbance was moving northward just east of the Mariana Islands. Along with supportive satellite data, the first warning on TD 17 was issued at 210600Z.

On the morning of the 20th, TD 17 began moving through a break in the subtropical ridge previously opened by Harriet. This was also an area of weak and variable steering currents. From the morning of the 21st to the evening of the 22nd. there was a lack of any definitive, middle tropospheric steering flow which resulted in the erratic movement of the storm. For 36 hours TD 17 meandered and then looped before heading northeastward (Fig. 4-18).

During the formative stages of TD 17, upper tropospheric, synoptic and satellite data indicated the presence of a weak tropical upper tropospheric trough (TUTT) to the northeast. As the disturbance reached tropical depression intensity, data indicated that a low in the TUTT had developed. The establishment of the TUTT low in this region allowed for an increase in the advection of mass away from the storm. This allowed for further intensification and the depression to reach tropical storm intensity during the course of its loop. Aircraft reconnaissance

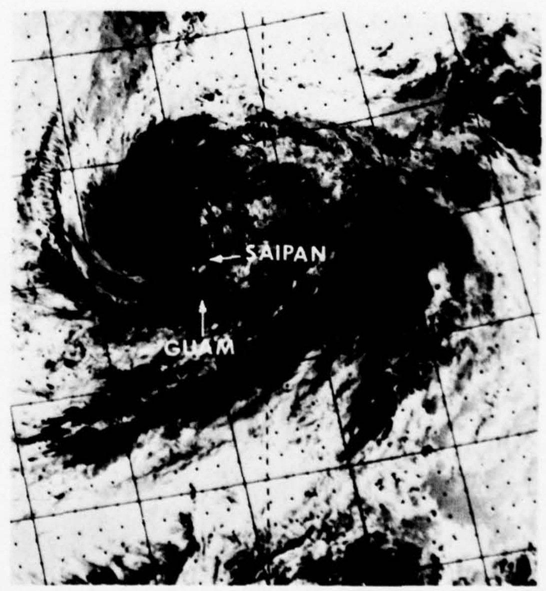


FIGURE 4-18. *Infrared photograph of Ivy with 40 kt (21 m/sec) winds executing a cyclonic loop, 22 October 1977, 0923Z. (DMSP imagery)*

on the 21st at 1545Z observed a maximum flight level, 700 mb, wind of 38 kt (20 m/sec) associated with the storm. Based on this data TD 17 was upgraded to Tropical Storm Ivy at 211800Z.

From the evening of the 22nd, the storm began to accelerate and move northeastward in response to an eastward moving short-wave trough in the mid-latitude westerlies. During this period the TUTT began to intensify. This created an upper air regime which was favorable for further intensification. On the morning of the 24th Ivy reached typhoon intensity. Reconnaissance aircraft at 0341Z recorded a central pressure of 967 mb and observed sustained, 700 mb winds of 75 kt (39 m/sec) about an eye 30 nm (56 km) in diameter.

After reaching typhoon intensity, Ivy continued to the northeast. This movement caused the storm to pass 20 nm northwest of Marcus Island (WMO 47991) at 241930Z. Marcus reported a sustained 70 kt (36 m/sec) at 1800Z and 111 kt (57 m/sec) gusts at 2100Z. As Ivy continued northeastward, further intensification took place. After establishment of other TUTT lows to the north and south of the storm, a maximum strength of 90 kt (46 m/sec) was reached on the 25th (Fig. 4-19). New aircraft data reported a well defined eye with a 945 mb central pressure.

Typhoon Ivy maintained maximum intensity for 12 hours. The continued northward displacement was due to the increasing influence of a quasi-stationary upper-level trough east of Japan. This also caused the storm to enter a cooler environment which began to degrade Ivy into an extratropical system. As a result, the last warning was issued at 261800Z. Ivy quickly weakened and became extratropical along a cold front.

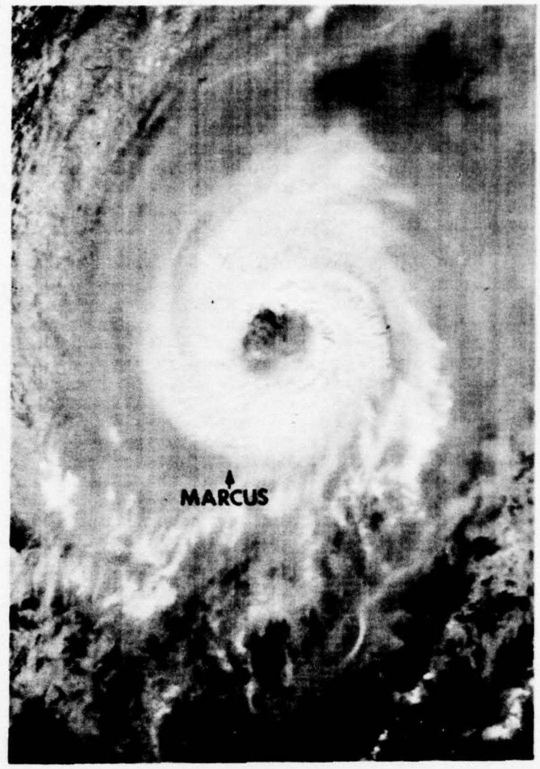
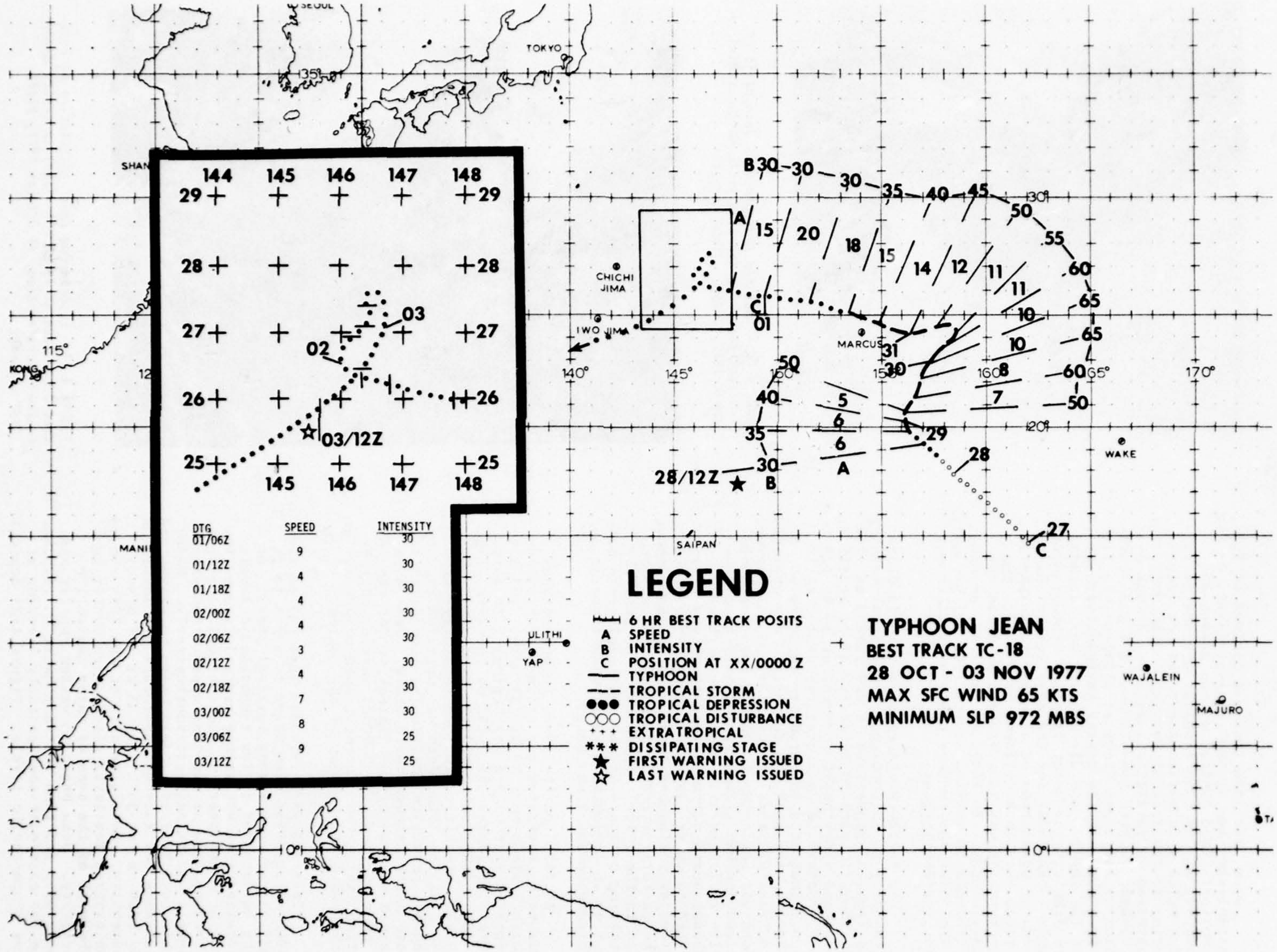


FIGURE 4-19. *Typhoon Ivy displaying a well defined eye at its maximum intensity of 90 kt (46 m/sec), 25 October 1977, 0106Z. (DMSP imagery)*


TYPHOON JEAN
BEST TRACK TC-18
28 OCT - 03 NOV 1977
MAX SFC WIND 65 KTS
MINIMUM SLP 972 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
DTG SPEED INTENSITY
01/06Z 9 30
01/12Z 4 30
01/18Z 4 30
02/00Z 4 30
02/06Z 3 30
02/12Z 4 30
02/18Z 7 30
03/00Z 8 30
03/06Z 9 25
03/12Z 25
03/12Z
28/12Z
TOKYO
SEOUL
CHICHI JIMA
IWO JIMA
MARCUS
SAIPAN
ULITHI
YAP
WAKE
WAJALEIN
MAJURO
115°
140°
145°
170°

Jean, the 18th tropical cyclone of 1977, established two season records; first, as the shortest-lived typhoon of the season and second, as the only tropical cyclone of 1977 for which a formation alert was not issued prior to the initial warning. Jean was first observed on satellite imagery as a weak disturbance located some 200 nm (371 km) southeast of Kwajalein Atoll at 2128Z on the 24th of October. While moving northwestward at 14 kt (26 km/hr), the disturbance was included on JTWC's Significant Tropical Weather Advisory (ABEH PGTW) for the next several days. Located downstream of an upper tropospheric trough axis in a difluent area aloft, the disturbance was in a favored position for development. By 1200Z on the 27th, an upper tropospheric outflow center (200 mb) was analyzed over the surface position further supporting development.

Due to the presence of a ship in close proximity to the cyclone, the initial warning on Tropical Depression 18 was issued at 1200Z on the 28th with an intensity of 30 kt (15 m/sec) and a northwest movement at 14 kt (26 km/hr). Satellite data over the next 6 to 12 hours indicated an intensity increase and at 1800Z on the 28th the depression was upgraded to tropical storm status. At this same time, Jean was beginning to show a more northward trend and had slowed appreciably to a speed of 6 kt (11 km/hr). The more northward thence north-northeastward track was attributed to upper- and mid-tropospheric level steering influences which were dominant above the easterly steering flow near the surface and in the lower troposphere. Because the steering currents at various levels were not acting in conjunction, a slowing trend in forward movement was noted.

At 0513Z on the 29th, reconnaissance aircraft penetrated the storm and observed surface winds near 60 kt (31 m/sec) and also reported that an eye was beginning to form. Satellite imagery at 0905Z on the 29th (Fig. 4-20) further supported the aircraft's observed intensification; consequently, at 1800Z on the 29th, Jean was upgraded to a typhoon. Satellite positioning also dictated a more north-northeastward track. Jean maintained minimum typhoon intensity for the next 6 hours through the 300000Z warning thereby establishing the aforementioned record as the shortest-lived typhoon of the season.

Post analysis revealed that beyond the 300000Z position Jean began to react to the effects of very strong vertical shear. At the surface and at low-tropospheric levels, steering flow was strong easterly around the southern periphery of the subtropical ridge. Steering flow at mid- and upper-tropospheric levels was strong west-southwesterly. Under this hostile regime, Jean began to weaken and had made her furthest northeastward incursion by 1200 on the 30th with 55 kt (28 m/sec) intensity. Satellite data on the 30th showed an exposed low-level circulation center to the west of the area of major convective activity. Jean began to weaken rapidly and move west and then west-northwest in response to the east/east-southeasterly steering at low tropospheric levels. Figure 4-21 depicts

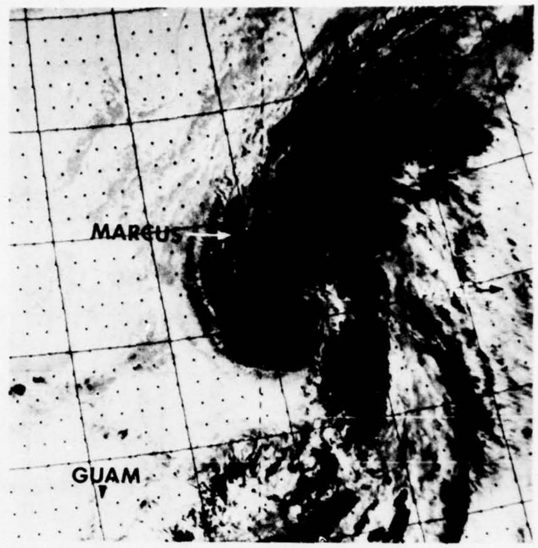


FIGURE 4-20. Infrared photograph of Jean at 55 kt (28 m/sec) intensity tracking north-northeastward, 29 October 1977, 0905Z. (DMSP imagery)

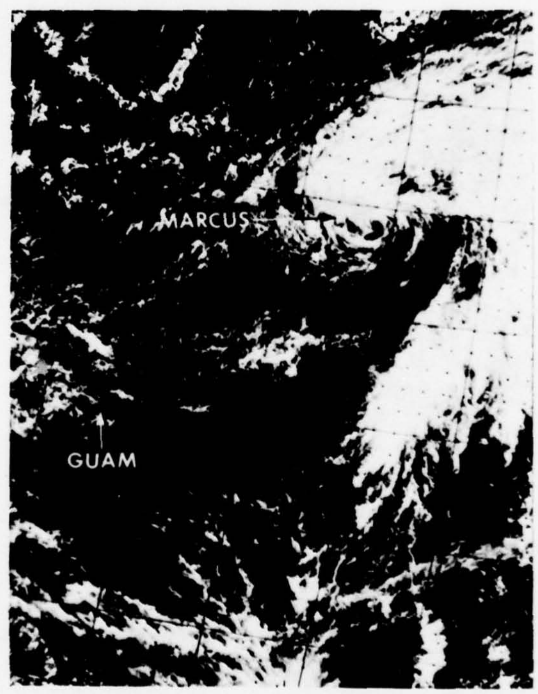


FIGURE 4-21. Exposed low level circulation of Tropical Storm Jean at 40 kt (21 m/sec) intensity during westward acceleration, 31 October 1977, 0102Z. (DMSP imagery)

the low level circulation center with the major convection sheared off to the east. Figure 4-22 is a graphic depiction of Jean's passage north of Marcus Island through three-hourly synoptic reports.

JTWC issued its expected final warning on TD 18 (formerly Tropical Storm Jean) at 1200Z on the 31st with a forecast dissipation within 12 hours. The low level circulation was closely monitored via satellite for signs of reintensification for the next 24-36 hours. By 2323Z on the 1st of November, the disturbance began to show an improved satellite signature with an increase in convective activity. TD 18 was reactivated and a warning was issued at 0000Z on the 2nd of November. AT this time, TD 18 began meandering northward at 3 to 4 kt (5.5 to 7.5 km/hr) and showed an intensity of 30 kt (15 m/sec). For the next 12 to 24 hours, the system executed a looping movement and by 1450Z on the 2nd satellite data again showed the effects of strong vertical shear with an exposed low level circulation again visible to the west of the main convection. Once sheared off, the low level circulation responded to low tropospheric, northeasterly flow around the southeastern periphery of a large anticyclone centered over the Sea of Japan. The final warning was issued at 031200Z with dissipation forecast by 031800Z. The low level circulation center continued tracking to the southwest and then west-southwest remaining weak and visible on satellite imagery until 0019Z on the 6th of November.

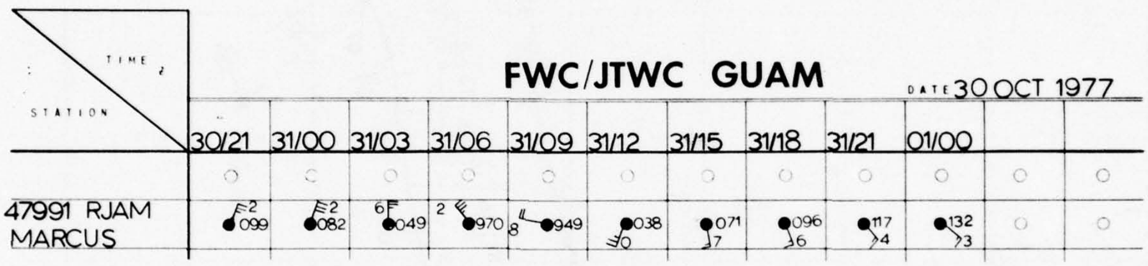
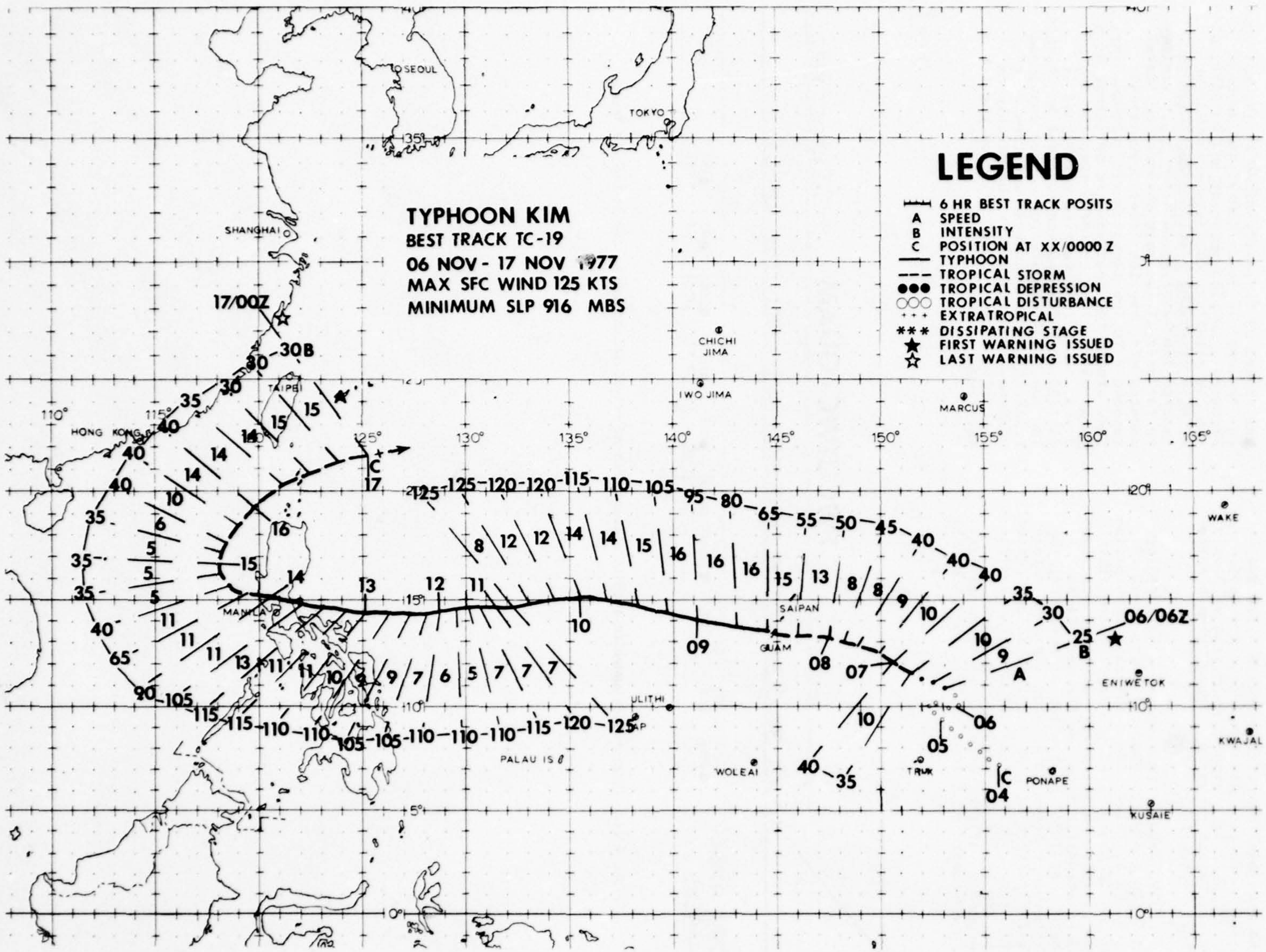


FIGURE 4-22. *Three-hourly synoptic surface observations at Marcus Island during the passage of Jean.*


TYPHOON KIM
BEST TRACK TC-19
06 NOV - 17 NOV 1977
MAX SFC WIND 125 KTS
MINIMUM SLP 916 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
TAIPEI
HONG KONG
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
WAKE
SAIPAN
GUAM
ULITHI
PALAU IS
WOLEAI
TRUK
PONAPE
ENIWETOK
KWAJAL
KUSAIE
06/06Z
17/00Z

Kim, the 9th typhoon of the season, originated in an active near-equatorial trough (NET), which extended through the western Marshall Islands. Weak surface circulations existed within this trough near Ponape and Kwajalein. During the 2nd of November, this activity had consolidated into a single surface circulation 100 nm (185 km) southwest of Ponape with a central pressure of 1007 mb. The disturbance began moving northwestward within the NET at approximately 6 kt (11 km/hr).

At 2155Z on the 3rd, satellite first fixed the disturbance and estimated the winds to be 20 kt (10 m/sec). A circulation center was located 150 nm (270 km) northwest of Ponape. With the weekend approaching, a formation alert was issued on the 4th as satellite and synoptic data indicated a strengthening surface circulation. Aircraft reconnaissance the next day found a central pressure of 1007 mb and estimated a maximum surface wind of 20 kt (10 m/sec). As the disturbance continued northwestward toward a broad, relative weakness in the strong mid-tropospheric subtropical ridge, synoptic and satellite data still indicated no significant development. Potential for development remained fair to good and the formation alert was therefore extended for 24 hours. A second aircraft investigation on the 6th fixed the system with a 1004 mb central pressure and maximum surface winds of about 25 kt (13 m/sec). Kim's first warning as TD 19 was issued at 0600Z on the 6th. The system was upgraded to Tropical Storm Kim just 12 hours later.

Kim next turned toward Guam at a speed of approximately 10 kt (19 km/hr). Slow intensification occurred during the next 48 hours due to the dominating presence of the strong subtropical ridge to the north. A short wave trough in the upper tropospheric westerlies also hampered rapid development by restricting outflow to the north of Kim. However, after the trough passed by, outflow aloft steadily strengthened. A deepening long wave trough over eastern Asia was now beginning to weaken the subtropical ridge which was previously suppressing Kim's low level development. Satellite data at 080204Z indicated increased organization (Fig. 4-23). Kim began intensifying at the rate of 30 kt (15 m/sec) in 24 hours and the central pressure dropped 22 mb in a 24 hour period.

Kim passed directly over Guam on 8 November between 1020Z and 1235Z approaching Guam from the east-southeast, moving westward over the island, and exiting toward the west-northwest. The eye entered with a circular configuration and exited with an elliptical configuration. Figure 4-24 depicts eye passage as seen by radar while Figure 4-25 displays the barograph trace recorded at Andersen AFB, Guam. The duration of the eye passage over the island lasted up to 1 hour and 10 minutes near the center of the storm track. The peak gust recorded was 77 kt (40 m/sec) on Nimitz Hill. The greatest damage was in the southern end of the island where 22 homes were damaged or destroyed (Figs. 4-26 and 4-27). Fortunately, no lives were lost on Guam.

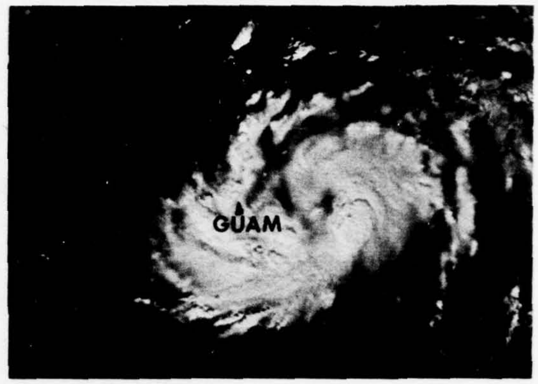


FIGURE 4-23. *Kim at 50 kt (26 m/sec) intensity, rapidly intensifying, and heading for Guam, 8 November 1977, 0204Z. (DMSP imagery)*

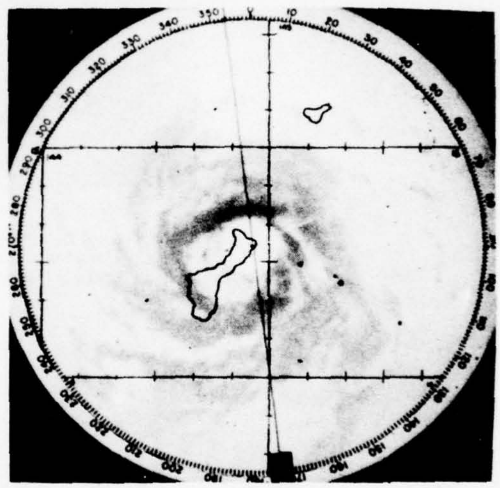


FIGURE 4-24. *Air Weather Service radar presentation of Kim at 60 kt (31 m/sec) intensity with the eye over Guam, 8 November 1977, approximately 1130Z. (Photograph courtesy of Det 2, 1WWg, Andersen AFB, Guam.)*

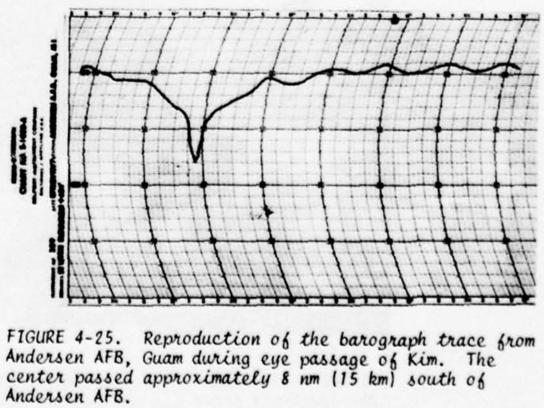


FIGURE 4-25. *Reproduction of the barograph trace from Andersen AFB, Guam during eye passage of Kim. The center passed approximately 8 nm (15 km) south of Andersen AFB.*

FIGURE 4-26. Kim's nearly typhoon strength winds battered the exposed, coastal village of Umatac. (Photograph courtesy of P. J. Ryan of the Pacific Daily News.)

FIGURE 4-27. Although damage was slight on most of the island, Umatac Village on the southwest coast did not fare so well. (Photograph courtesy of P. J. Ryan of the Pacific Daily News.)

Kim was upgraded to typhoon strength at 2200 local on the 8th just after exiting Guam. For the next 48 hours the storm continued to intensify. The subtropical ridge continued to slowly weaken throughout this period, but it maintained sufficient strength to steer Kim in a west-northwestward direction. Moving at approximately 15 kt (28 km/hr), Kim advanced toward another weakness in the ridge located between two subtropical high pressure cells. As the tropospheric steering flow weakened, forward speed decreased and intensification increased. When Kim was nearest this weakness within the ridge, she attained a speed minimum, 5 kt (9 km/hr), and an intensity maximum of 125 kt (64 m/sec) (Fig. 4-28).

Kim now took on a more westward track as she came under the influence of the next subtropical high cell. Kim was also gradually approaching a deep, quasi-stationary, upper tropospheric trough over Asia. This trough produced strong southwesterly flow which began to restrict outflow ahead of Kim resulting in decreasing intensity. At the same time, a deepening low cell in the Tropical Upper Tropospheric Trough (TUTT) was slowly approaching Kim from the east. This low cell eventually came in position to enhance upper level outflow. A secondary maximum intensity, 120 kt (62 m/sec), was achieved from this interaction.

Kim was soon headed straight for central Luzon (Fig. 4-29). Landfall occurred on the 13th causing extensive damage on the coastline with winds of 115 kt (59 m/sec). The storm passed about 35 nm (65 km) north of Manila and 5 nm (9 km) south of Clark AB.

The typhoon exited into the South China Sea 7 hours after landfall with an intensity of 65 kt (33 m/sec). This amount of weakening is in good agreement with the latest climatological studies of intense typhoons crossing Luzon. Even though the South China Sea still had warm sea surface temperatures, Kim never reintensified due to strong, cool northeast monsoon flow entraining into the storm environment. By this time the mid-latitude westerlies had sufficiently weakened the subtropical ridge which separated Kim from the westerlies. Rapidly decelerating, Kim turned northward in response to the steady southwesterly steering flow being produced by an approaching upper tropospheric trough. Increased upper level shearing began the storm's extratropical transformation. Turning northward, Kim entered deeper westerly flow and was accelerated northeastward through the Bashi Channel. Kim became an extratropical system by 0000Z on the 17th and merged with a weak frontal system east of Taiwan.

Kim was a long-lived storm with 44 warnings issued during a 12 day period. Guam sustained moderate property damage when Kim crossed the island as a strong tropical storm. Luzon, however, reported 55 drownings due to widespread flooding. In Manila, a fire in a hotel, caused by a lighted candle, during the height of the storm resulted in 47 deaths. Minor damage occurred at Clark AB with a roof blown from a school building and falling trees causing other damage. One ship was reported sunk while another went aground as Kim exited into the South China Sea.

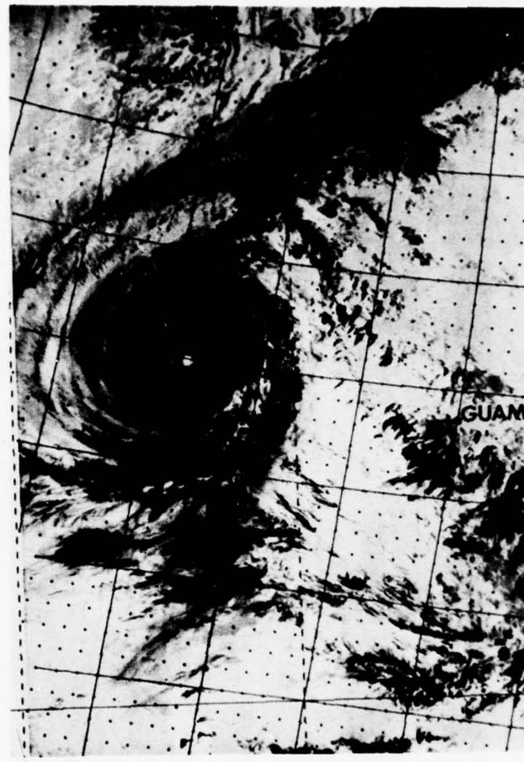


FIGURE 4-28. Infrared photograph of Typhoon Kim at peak intensity of 125 kt (64 m/sec), 10 November 1977, 2145Z. (DMSP imagery)

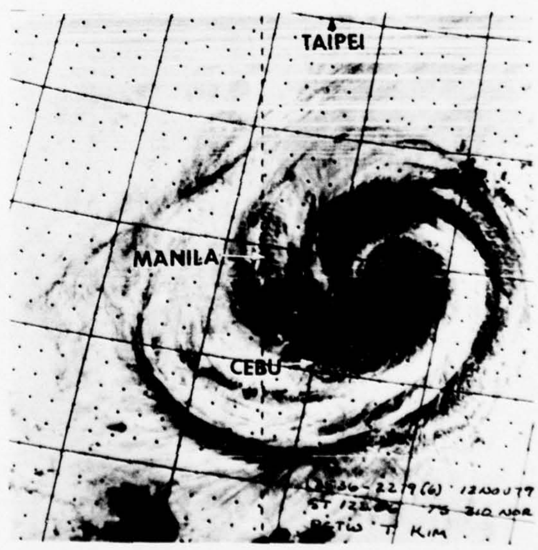
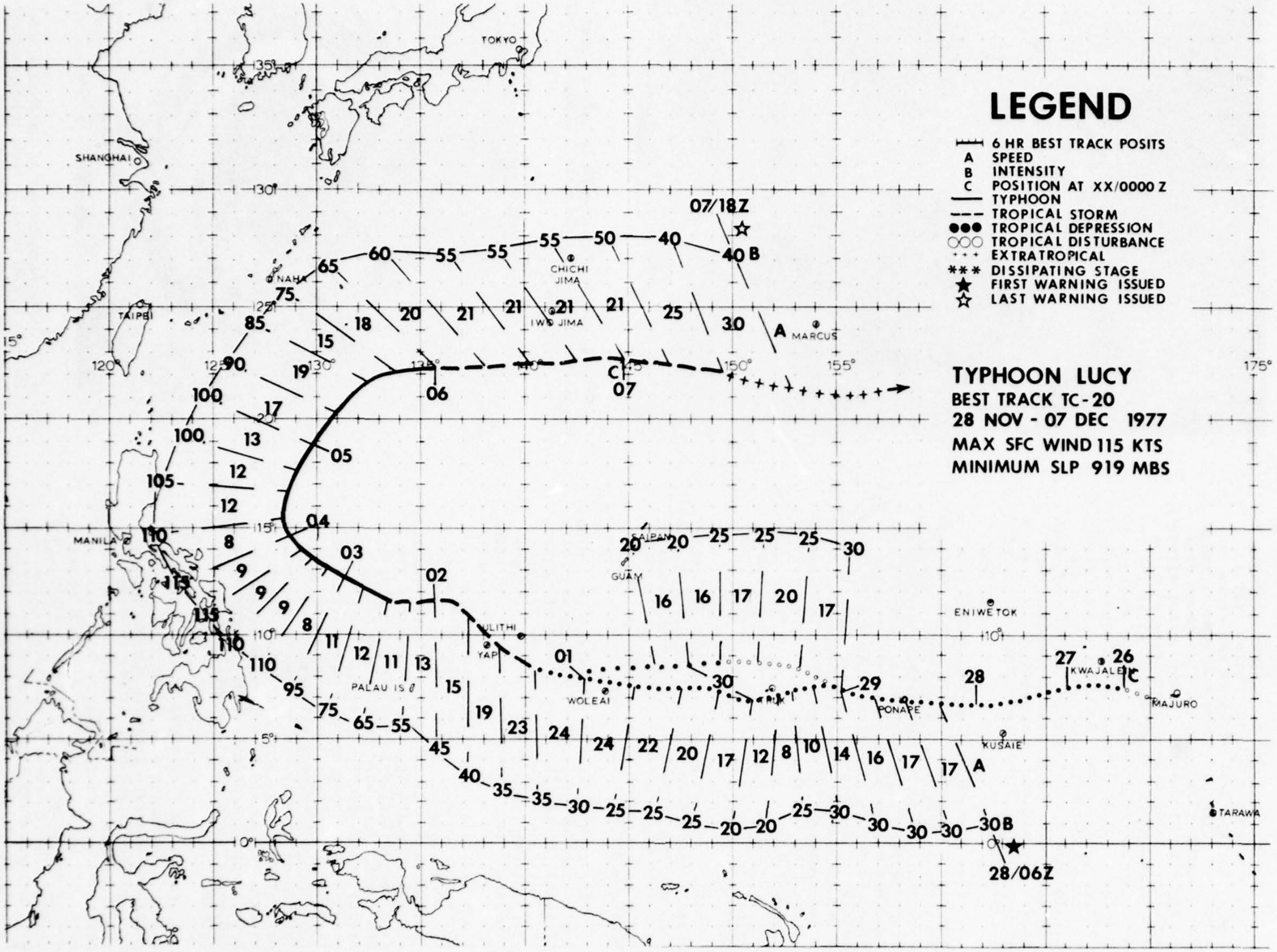


FIGURE 4-29. Infrared photograph of Typhoon Kim with 110 kt (57 m/sec) winds about 20 hours before landfall on the Philippine Islands, 12 November 1977, 2255Z. (DMSP imagery)



LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0000 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
TYPHOON LUCY
BEST TRACK TC-20
28 NOV - 07 DEC 1977
MAX SFC WIND 115 KTS
MINIMUM SLP 919 MBS
07/18Z
28/06Z
TOKYO
SHANGHAI
TAIPEI
NAHA
MANILA
CHICHI JIMA
IWO JIMA
MARCUS
GUAM
SAIPAN
ULITHI
YAP
PALAU IS
WOLEAI
PONAPE
ENIWETOK
KWAJALEIN
MAJURO
KUSAIE
TARAWA

Lucy, the 10th typhoon, was in most respects a typical winter season storm. Development was difficult and near the equator while recurvature occurred at a low latitude. An unusual event happened during the development stage when the system divided into two disturbances and then recombined 2 days later.

As with the previous typhoon (Kim), Lucy's birth was a "double vortice" development pattern discussed by many authors. The earliest accounts of tropical storms occurring simultaneously on both sides of the equator are described in a book "The Law of Storms" by Reid (1849). In this particular case the tropical cyclone in the Southern Hemisphere near equatorial trough (NET) developed first and was well on its way to maturity before Lucy formed in the Northern Hemisphere NET. The expanding circulation about the Southern Hemisphere TC 24-77 (Steve) strengthened the westerly flow along the equator increasing the horizontal shear along the Northern Hemisphere NET aiding the development of Lucy (Fig. 4-30). On the 26th, 33 kt (17 m/sec) gradient level winds were observed at Tarawa (WMO 91610), an island about 75 nm (139 km) north of the equator. Westerlies extended above 500 mb and created an extensive horizontal wind shear trough north of the equator. Enough cyclonic spin was imparted over the Marshall Island area that the nearby preexisting disturbance began to develop. All factors for further development were present therefore, at 270600Z a Tropical Cyclone Formation Alert was issued.

A large mid-tropospheric anticyclone dominated the subtropical western Pacific and concentrated strong trade winds north of the depression. The system soon began accelerating westward as it neared the anticyclone's southern domain. Synoptic data indicated an increase in circulation size and satellite imagery showed better organization. Weather reconnaissance aircraft were sent in to investigate further. Early on the 28th aircraft found a 997 mb surface pressure center with 30 kt (15 m/sec) surface winds and 45 kt (23 m/sec) flight level winds at 1500 ft (457 m). JTWC thus issued their first warning on TD 20 at 280600Z. Six hours later the depression crossed the southern coast of Ponape (WMO 91348) with only 10 kt (5 m/sec) sustained and 25 kt (13 m/sec) gusts reported. These unexpectedly weak surface winds supported prior aircraft reports which observed maximum winds at flight level, not surface.

On the 29th TD 20 split into two disturbances. One went northwestward and the other west-southwest around the Truk Islands (Fig. 4-31). This split occurred when increasing amplitudes in the mid-latitude long wave patterns strengthened the subtropical, mid-tropospheric anticyclone which was positioned north of TD 20. The pressure gradient between TD 20 and the high pressure cell generated 45 kt (23 m/sec) easterly flow at 500 mb. The resulting intense, horizontal shear produced enough vorticity to induce a secondary circulation system just north of TD 20. As they separated, both systems weakened as their energy sources also became divided.

Because the northern system was generated in the mid-troposphere, it was reflected on the surface only as a weak depression. Infrared satellite imagery identified the northern split as having more activity at higher levels. Aircraft and synoptic data indicated better organization in the southern split. The northern system reached a maximum forward speed of 20 kt (37 km/hr) as the pressure gradient peaked. This rapid movement

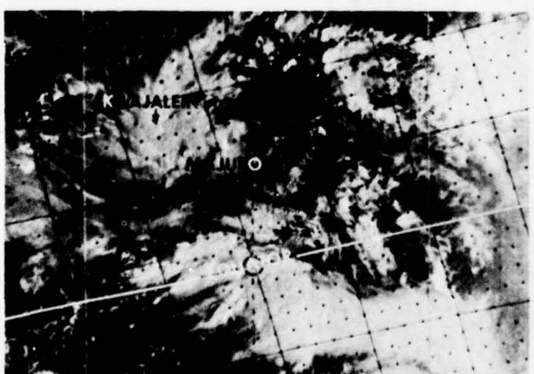


FIGURE 4-30. "Double Vortices". Lucy is seen in her formative stage in the Northern Hemisphere NET between Kwajalein and Majuro while TC 24-77 (Steve) is near maturity in the Southern Hemisphere NET, 25 November 1977, 2118Z. (NOAA-5 imagery)

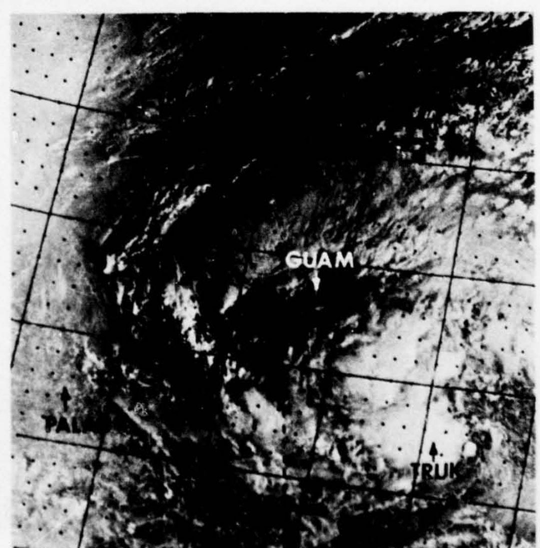


FIGURE 4-31. Lucy during an unusual split configuration while over the Caroline Islands, 29 November 1977, 2125Z. (DMSP imagery)

placed the secondary disturbance well ahead of TD 20's primary circulation. As the dual system moved westward away from the dominating influence of the subtropical high, horizontal shear and induced vorticity diminished. This resulted in the northern system's deceleration and dissipation. The southern, primary, system soon caught up to and absorbed the remnants of the northern system 100 nm (185 km) northwest of Woleai Atoll. By 0000Z on the 1st of December, TD 20 was again a single system with the same intensity as it was before the split.

TD 20 now began heading northwestward around the southwestern periphery of the steering anticyclone toward a break in the subtropical ridge. Deceleration and intensification progressed for the next 2 days. TD 20 became Tropical Storm Lucy at 010600Z. Aircraft data, however, still indicated that the storm was best developed in the middle layers. This was again evidenced when Lucy passed 25 nm (46 km) northwest of Yap (WMO 91413) which only experienced 15 kt (8 m/sec) sustained surface winds and a sea-level pressure minimum of 1001 mb.

Continuing northwestward, Lucy appeared to be heading for a recurvature path. An intense, short-wave trough was passing north of Lucy, with an apparent weakening in the subtropical ridge. But the trough quickly passed, trailing a migratory anticyclone behind and Lucy again took a more westward track. Now headed for the Republic of the Philippines, Lucy attained typhoon intensity at 020600Z and continued to deepen. Synoptic and satellite data showed excellent upper level divergence in all quadrants. Aircraft reconnaissance began reporting maximum winds nearer the surface, indicating better vertical development. By this time Lucy attained a maximum intensification rate of 20 kt (10 m/sec) per 6 hours and satellite data revealed a large, well defined eye (Fig. 4-32).

By the 3rd of December, Lucy was again heading northwestward as a strong westerly trough began creating another weakness in the subtropical ridge. In 24 hours the ridge west of Lucy had completely dissipated. Lucy's easterly steering currents rapidly weakened under increasing pressure from the advancing trough. At 1800Z on the 3rd, a 115 kt (59 m/sec) maximum intensity was reached with a minimum forward speed of 8 kt (15 km/hr). Within the next 12 hours, Lucy recurved ahead of the approaching trough.

The storm soon became completely embedded in mid-latitude westerly flow and accelerated northeastward. Lucy was downgraded to tropical storm stage 48 hours after recurvature. Upper level vertical shear and low level cool, dry entrainment became the significant factors for weakening. Lucy was eventually steered into a frontal zone and became an extratropical wave within the boundary.

The last warning was issued at 071800Z. Lucy's extratropical transformation extended over several days since both polar and tropical air flows converged into the system. Lucy traveled eastward as a weak cyclone along the front and was eventually absorbed into a large, winter storm system over the central Pacific.

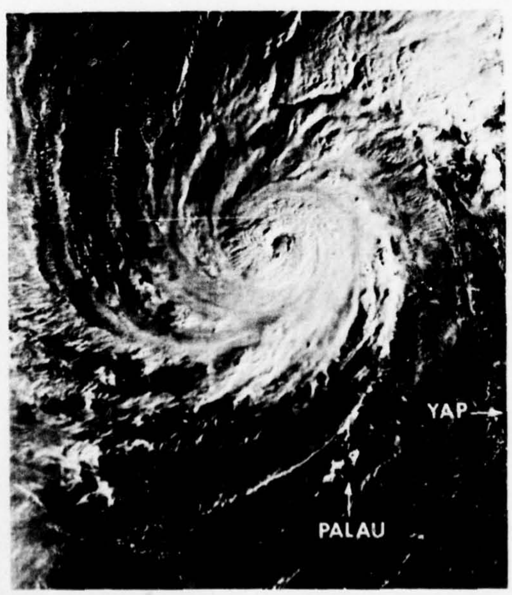
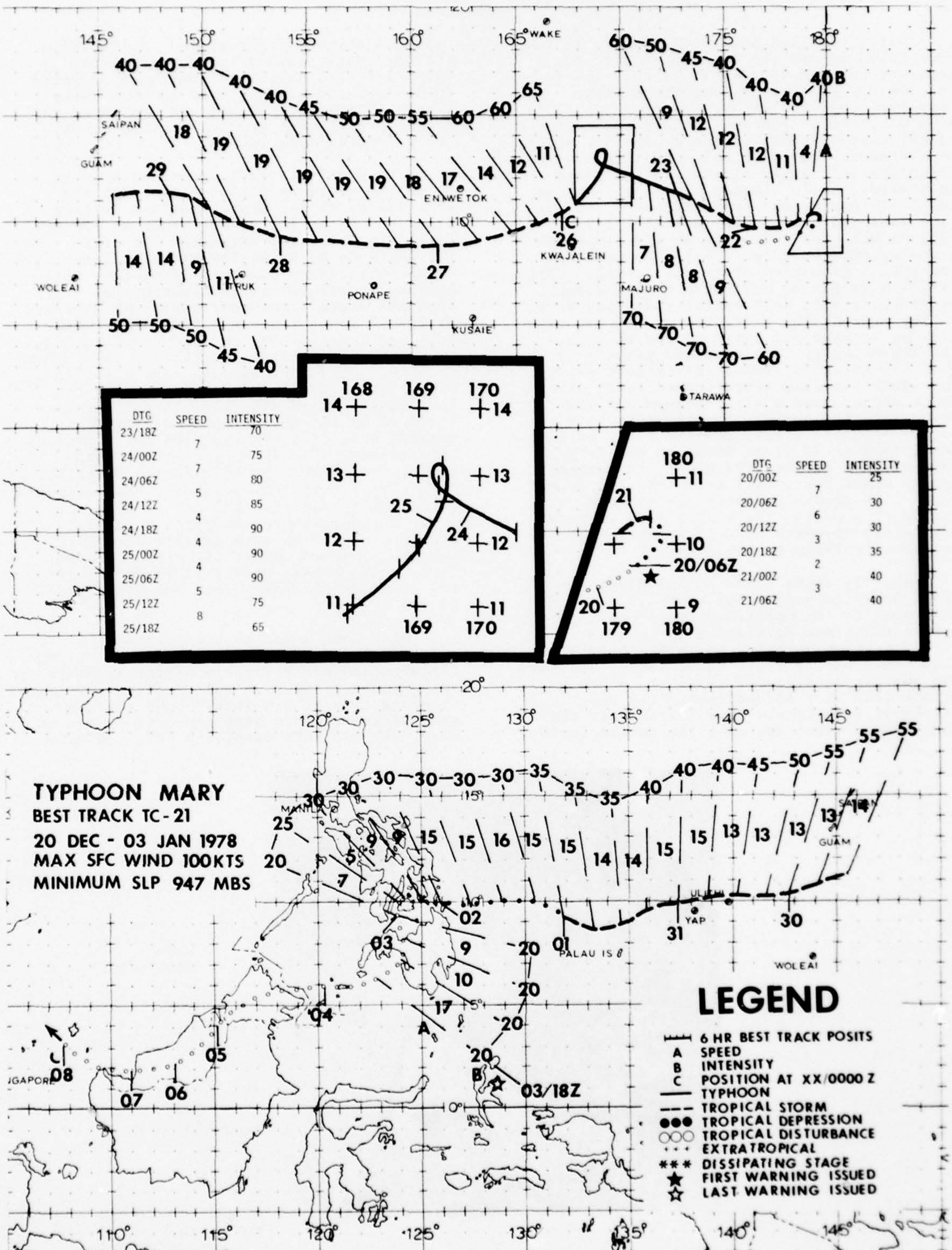


FIGURE 4-32. *Typhoon Lucy with 85 kt (44 m/sec) winds and undergoing rapid deepening, 2 December 1977, 2215Z. (DMSP imagery)*



DTG	SPEED	INTENSITY
23/18Z	7	70
24/00Z	7	75
24/06Z	5	80
24/12Z	4	85
24/18Z	4	90
25/00Z	4	90
25/06Z	5	90
25/12Z	8	75
25/18Z		65

DTG	SPEED	INTENSITY
20/00Z	7	25
20/06Z	6	30
20/12Z	3	30
20/18Z	2	35
21/00Z	3	40
21/06Z		40

Mary, the 11th and final typhoon of the year moved across the western Pacific for 15 days and covered 4002 nm (7445 km), the second longest storm on record for distance traveled. On the 19th of December satellite data detected a tropical disturbance moving slowly east-northeastward near 9N-177E where weak steering currents existed. Steering was primarily influenced by the winter season westerlies, which extended far into the subtropics. During the next few hours, satellite data indicated slow intensification while a well defined comma shaped cloud was becoming evident (Fig. 4-33). At 0000Z on the 20th a formation alert was issued. Upper air data at 500 mb indicated that a strong mid-tropospheric subtropical ridge had formed to the west of the disturbance. At the same time an intense mid-latitude 500 mb trough was approaching. The combined effects of this trough and a strong anticyclone above the storm produced steady upper level divergence and created a well defined outflow channel to the north. Further intensification appeared likely and the first warning was issued on TD 21 at 0600Z on the 20th. However, for the next 24 hours, the system became quasi-stationary near 10N-179E as the westerlies gradually receded northward. During this period the system grew to tropical storm strength as GOES imagery indicated increased outflow to the north.

Shortly after 1200Z on the 21st, the storm began to accelerate westward. The 500 mb trough to the north had moved eastward with a ridge now developing north of Mary. This formation imparted westerly steering flow south of the ridge axis. Mary responded and quickly accelerated to 12 kt (22 km/hr). On the 22nd Mary turned toward the west-northwest in response to a shallow mid-latitude trough which weakened the subtropical ridge northwest of the storm. By 0000Z on the 23rd Mary reached typhoon intensity as satellite data indicated continued increase in outflow and formation of an eye. Mary slowed to 8 kt (15 km/hr) and continued moving west-northwest for the next 30 hours while intensifying further.

The first aircraft reconnaissance entered the storm at 0115Z on the 24th and reported 90 kt (46 m/sec) maximum surface winds and 75 kt (39 m/sec) winds at 700 mb. Satellite data also estimated the storm intensity to be 75 kt (39 m/sec). About five hours later, Mary began to decelerate while nearing a weakness in the subtropical ridge. Then the storm turned northward and appeared as though recurvature was beginning. However, analysis of 500 mb synoptic data indicated the mid-latitude westerlies were again receding. The subtropical ridge again re-established itself and Mary responded by looping clockwise and was subsequently influenced by the northerly flow around the eastern edge of a strong, eastward migrating anticyclone. The storm now moved south-southwestward at 5 kt (9 km/hr). Satellite data (Fig. 4-34) indicated Mary had continued to intensify and at 0314Z on the 25th aircraft reconnaissance indicated a central pressure of 947 mb with maximum sustained surface winds of 100 kt (51 m/sec). Just three hours later, Utirik Atoll 55 nm (102 km) southeast of Mary, recorded winds of 40 kt (21 m/sec).

Mary soon began to accelerate to 12 kt (22 km/hr) towards the west-southwest along the southeastern periphery of the strengthening subtropical high cell. The resulting steering flow at mid-levels plus rapid movement of the typhoon were expected to weaken Mary. By the 26th satellite data indicated

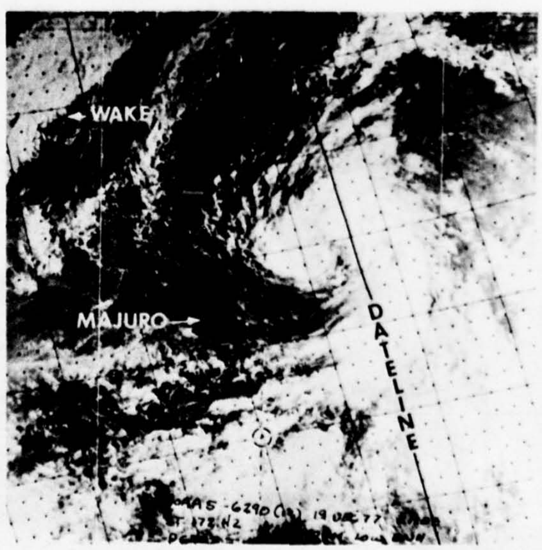


FIGURE 4-33. *Mary during initial development near the dateline, 19 December 1977, 2110Z. (NOAA-5 imagery)*

Mary had indeed weakened and Mary was downgraded to a tropical storm. Aircraft reconnaissance at 0357Z on the 26th confirmed corresponding satellite data when 60 kt (31 m/sec) surface winds were observed.

As Mary turned westward along the southern boundary of the subtropical high cell, the storm accelerated to 19 kt (35 km/hr). By the 28th Mary began moving west-northwestward in response to another trough induced weakness in the subtropical ridge. Mary again slowed due to the weaker steering currents. Satellite data once again indicated intensification (Fig. 4-35). As the trough moved rapidly eastward, the subtropical ridge again strengthened north of the storm and Mary turned west-southwestward and began to weaken for the second time. Accelerating steadily Mary attained a 15 kt (28 km/hr) forward movement and continued to weaken as development became restricted by the expanding ridge.

Mary continued her westward movement for the next several days. Weakening slowly, the storm was downgraded to a tropical depression at 0000Z on the 1st of January. The system maintained 30 kt (15 m/sec) winds until moving over the central Philippines near Leyte Gulf. Satellite data indicated rapid dissipation over land with the final warning issued at 1800Z on the 3rd. Mary turned sharply southward over the Philippines when the strong northeast monsoon was encountered, which aided rapid dissipation.

Although Mary was not the longest lived storm on record, the 4002 nm (7445 km) distance traveled was the second longest. What is also noteworthy is that no injuries or major damage resulted during its long journey across the western Pacific. Mary was indeed a fitting end to a most unusual tropical cyclone year.

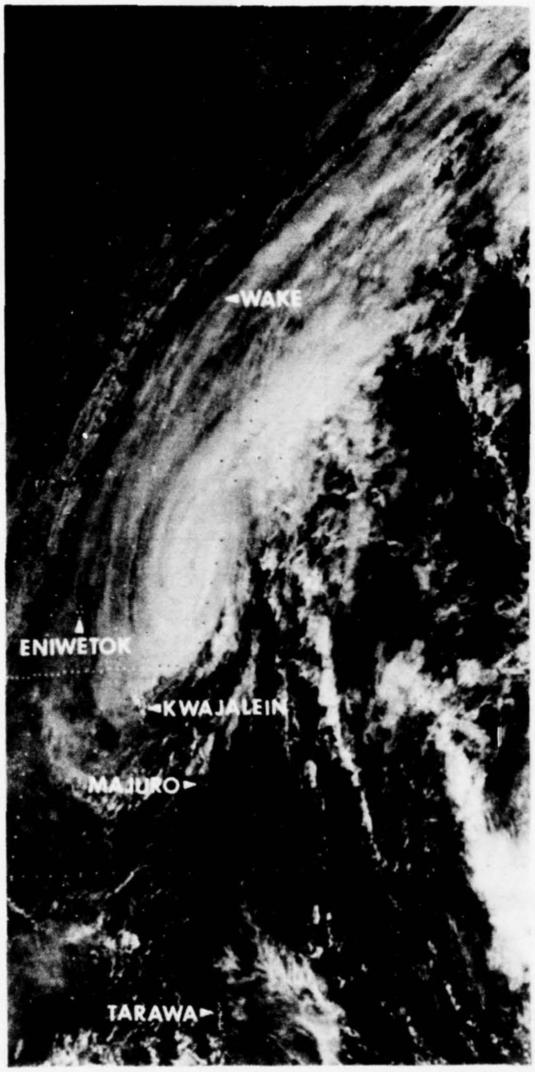


FIGURE 4-34. *Typhoon Mary during execution of a loop 6 hours before attaining a maximum 100 kt (51 m/sec) intensity, 24 December 1977, 2049Z. (GOES imagery from SFSS, Honolulu, HI)*

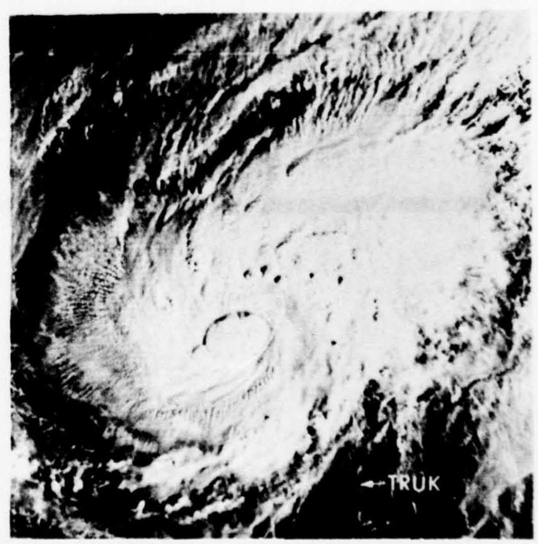


FIGURE 4-35. *Mary at 50 kt (26 m/sec) intensity and slowly deepening between Guam and Truk, 28 December 1977, 2136Z. (DMSP imagery)*

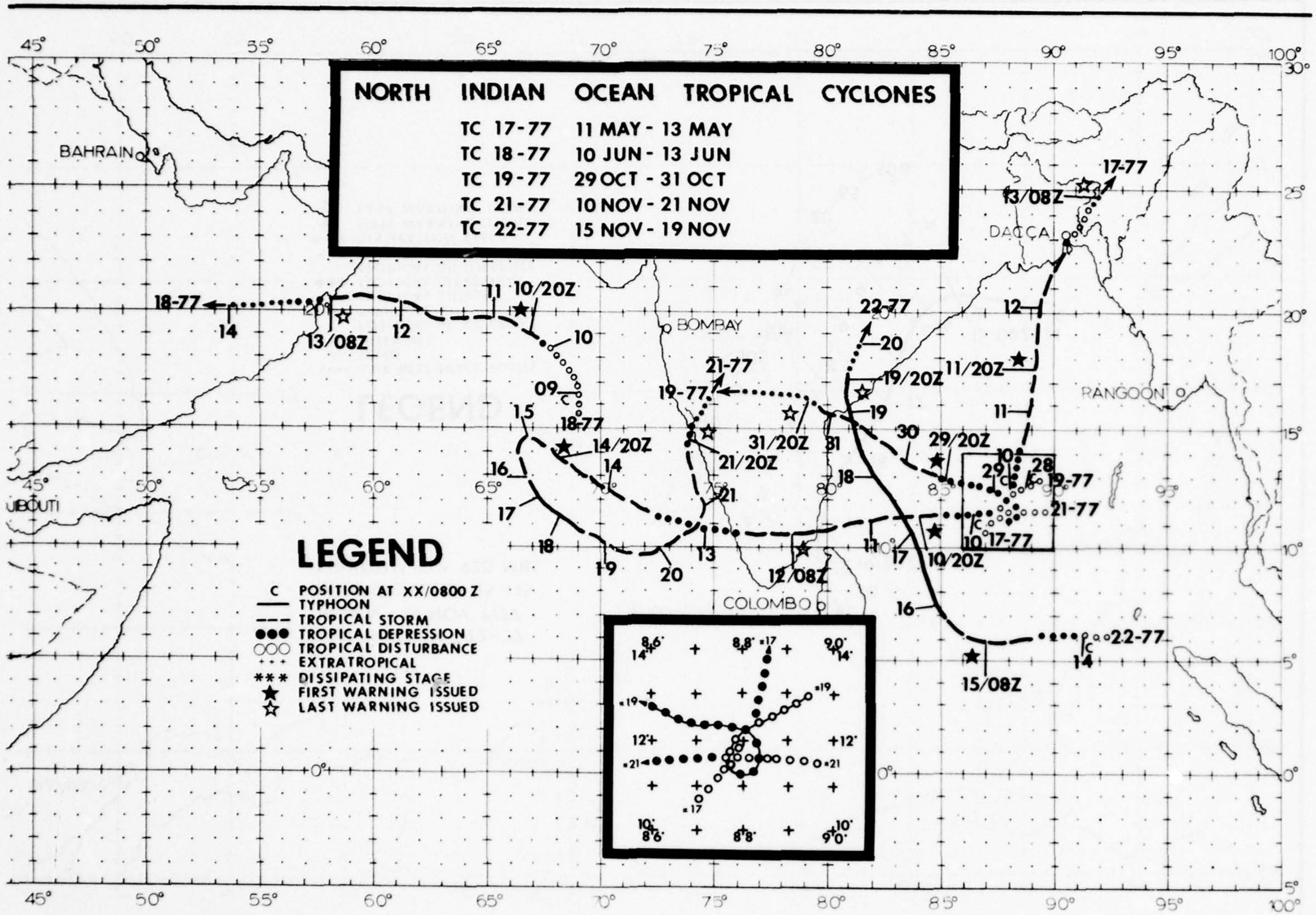
2. NORTH INDIAN OCEAN TROPICAL CYCLONES

During 1977, there were five tropical cyclones in the North Indian Ocean (Table 4-6). These occurrences were climatologically consistent; two in the spring and three in the autumn. However, these cyclones persisted much longer and were more intense than normal. TC 21-77, for example, developed in the Bay of Bengal, traversed southern India, regenerated in the Arabian Sea, looped while reaching typhoon strength, then finally dissipated over southwestern India after traveling a total of 1387 nm (2570 km). TC 22-77 was the next and largest cyclone this season. It became the third and most destructive storm to hit India. Because of its strength and devastating impact, TC 22-77 is further discussed in the following individual summary.

TABLE 4-6. FREQUENCY OF NORTH INDIAN OCEAN CYCLONES BY MONTH AND YEAR.

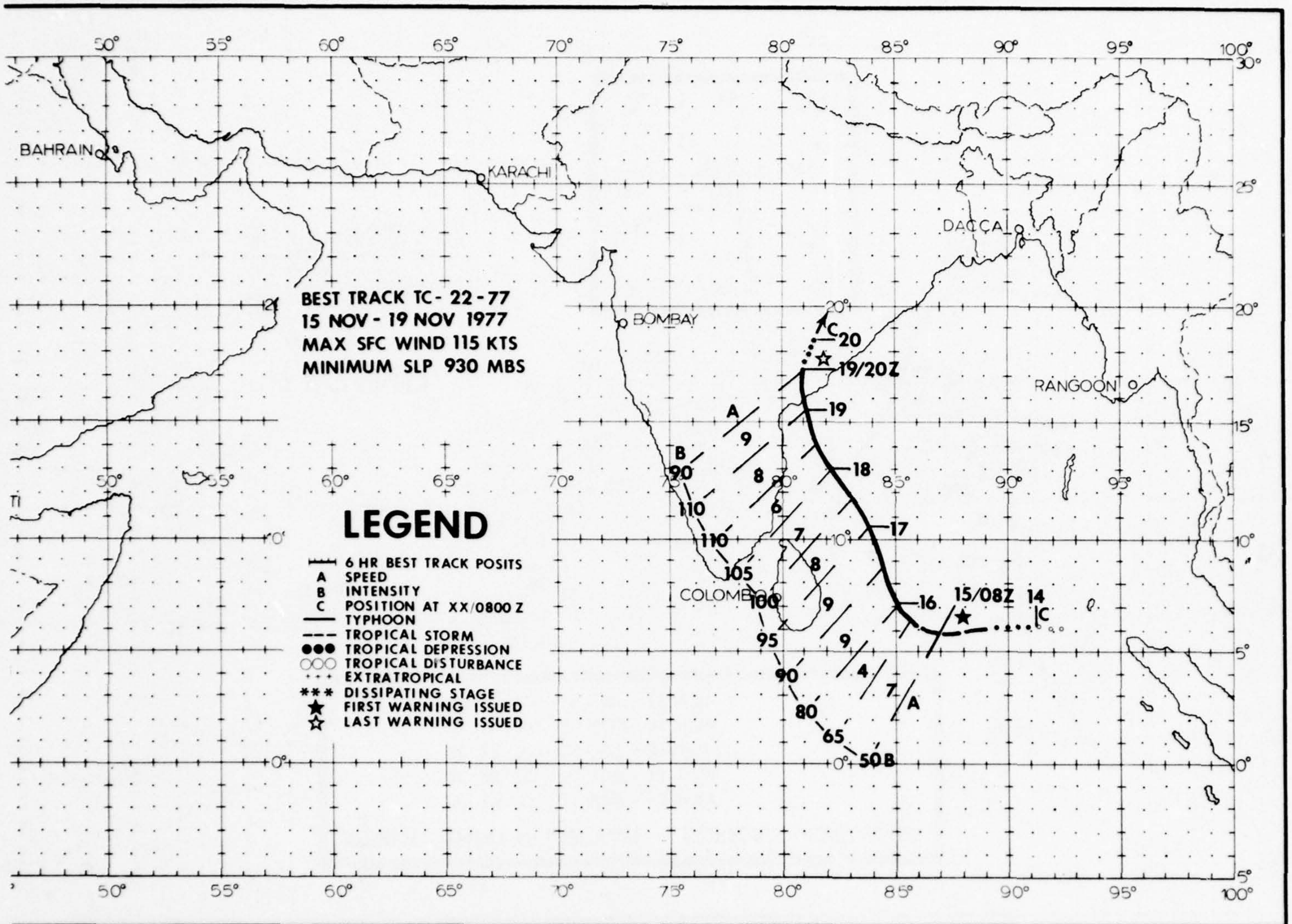
YEAR*	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
1971	0	0	0	0	0	0	0	0	0	1	1	0	2
1972	0	0	0	1	0	0	0	0	2	0	1	0	4
1973	0	0	0	0	0	0	0	0	0	1	2	1	4
1974	0	0	0	0	0	0	0	0	0	0	1	0	1
1975	1	0	0	0	2	0	0	0	0	1	2	0	6
1976	0	0	0	1	0	1	0	0	1	1	0	1	5
1977	0	0	0	0	1	1	0	0	0	1	2	0	5
AVG	0.1	0	0	0.3	0.4	0.3	0	0	0.4	0.7	1.3	0.3	3.9

*1971-1974 REPRESENT BAY OF BENGAL CYCLONES ONLY



NORTH INDIAN OCEAN TROPICAL CYCLONES
TC 17-77 11 MAY - 13 MAY
TC 18-77 10 JUN - 13 JUN
TC 19-77 29 OCT - 31 OCT
TC 21-77 10 NOV - 21 NOV
TC 22-77 15 NOV - 19 NOV
LEGEND
C POSITION AT XX/0800 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
BAHRAIN
DACCA
BOMBAY
RANGOON
COLOMBO
DJIBOUTI
18-77
17-77
19-77
21-77
22-77
13/08Z
10/20Z
14/20Z
11/20Z
19/20Z
29/20Z
31/20Z
21/20Z
12/08Z
10/20Z
15/08Z

/62 (NEW 2-76)


BEST TRACK TC- 22-77
15 NOV - 19 NOV 1977
MAX SFC WIND 115 KTS
MINIMUM SLP 930 MBS
LEGEND
6 HR BEST TRACK POSITS
A SPEED
B INTENSITY
C POSITION AT XX/0800 Z
TYPHOON
TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
BAHRAIN
KARACHI
BOMBAY
DACCA
RANGOON
COLOMBO
15/08Z
19/20Z
50°
55°
60°
65°
70°
75°
80°
85°
90°
95°
100°
30°
25°
20°
15°
10°
5°
0°

TC 22-77 was the most devastating storm in the Indian Ocean since 1971. It developed 115 kt (59 m/sec) winds and inundated Southeastern India with heavy rains and high seas. TC 22-77 occurred during the autumn monsoon transition period, when cyclone development is most favorable, and became the only storm to attain typhoon strength this season in the Bay of Bengal.

Meteorological satellite first located TC 22-77 during the morning of the 14th of November as a weak disturbance, approximately 150 nm (278 km) southwest of the Nicobar Islands. Five hours later new satellite data revealed better defined banding which indicated increased organization. This prompted the issuance of a formation alert the same day at 1310Z. Heading due west along the southern periphery of the mid-tropospheric subtropical ridge, the disturbance quickly accelerated to 13 kt (24 km/hr), while steadily intensifying. Later satellite and synoptic data supported a well developed cyclone of about 40 kt (21 m/sec). At 0800Z on the 15th the first warning was issued. A post analysis showed that TC 22-77 was rapidly developing during this period.

Ever since TC 22-77 was first detected, an upper tropospheric trough was forming over northern India. By the 15th this trough was firmly established and extended over central India, creating a break in the subtropical ridge. As the cyclone neared India, it began moving northwestward toward the trough induced break. This break also weakened the mid-tropospheric anticyclone and consequently reduced the storm's steering flow, and as a result, TC 22-77 steadily slowed to a 4 kt (7 km/hr) movement. It was now intensifying at the rate of 30 kt (15 m/sec) per 24 hours, primarily in response to the divergent southwesterly flow produced by the upper level trough above the approaching cyclone. TC 22-77 attained typhoon strength by the afternoon of the 15th, and by 0629Z on the 16th satellite data revealed an eye.

For the next 2 days, TC 22-77 tracked north-northwestward at an average speed of 9 kt (17 km/hr) while continuing to strengthen. By the 18th, it began to decelerate and was intensifying 10 kt (5 m/sec) each day. Successive satellite pictures showed tighter banding features while the eye became more distinct (Fig. 4-36). Approximately 75 nm (140 km) from the Indian coast, TC 22-77 reached a maximum intensity of 115 kt (59 m/sec). Just prior to landfall, TC 22-77 accelerated to 9 kt (17 km/hr) toward the north-northwest. At 1100Z on the 19th, the storm struck with sustained winds of 105 kt (54 m/sec) and an 18 ft (5.5 m) tidal wave along the coast of Andhra Pradesh about 40 nm (75 km) south of Vijayawada (WMO 43181). TC 22-77 then turned northward over flat farm lands while weakening slowly, and the final warning was issued at 2000Z on the 19th.

The combined winds, seas and rains generated by TC 22-77 killed nearly 10,000 people, left hundreds of thousands homeless and devastated lands that produce roughly 40 per cent of India's food grains. The tidal wave was probably the single most destructive force accompanying the storm. It penetrated 10 nm (19 km) inland and washed away more than 21 villages.

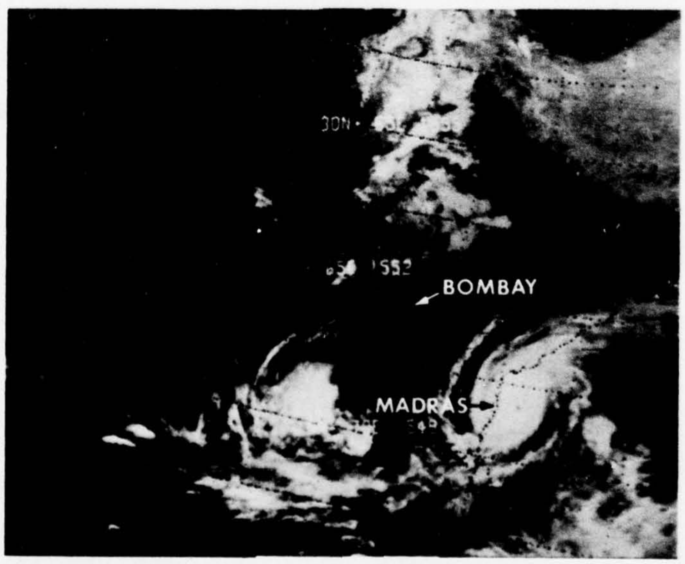


FIGURE 4-36. *Infrared photograph of TC 22-77 at maximum intensity of 115 kt (59 m/sec), 18 November 1977, 1618Z. In the Arabian Sea TC 21-77 with 65 kt (33 m/sec) winds completing a loop before striking southwestern India.* (NOAA-5 *imagery from* FLEWEAFAC *Suitland, MD*)

3. CENTRAL NORTH PACIFIC TROPICAL CYCLONES

No tropical cyclones developed over the central North Pacific during 1977 (Table 4-7).

TABLE 4-7. FREQUENCY OF CENTRAL PACIFIC STORMS BY MONTH AND YEAR. (NUMBER IN PARENTHESIS INDICATE STORMS REACHING HURRICANE INTENSITY)

	JAN-JUN	JUL	AUG	SEP	OCT	NOV-DEC
1967	0	0	0	0	1	0
1968	0	0	2	0	0	0
1969	0	0	0	0	0	0
1970	0	0	1	0	0	0
1971	0	1 (1)	1	0	0	0
1972	0	0	3 (1)	1	0	0
1973	0	1 (1)	0	0	0	0
1974	0	0	2 (1)	0	0	0
1975	0	0	0	0	0	0
1976	0	0	0	1 (1)	0	0
1977	0	0	0	0	0	0
AVERAGE	0	.2(.2)	.8(.2)	.2(.1)	.1	0

CHAPTER V – SUMMARY OF FORECAST VERIFICATION DATA

1. ANNUAL FORECAST VERIFICATION

a. POSITION FORECAST VERIFICATION

Forecast positions at initial warning times and those at 24-, 48-, and 72-hour times are verified against the best track. Positions for dissipated or extrapolated storms are not verified. In addition to the overall verifications depicted in Table 5-1, a separate verification for only Pacific Area typhoons is computed. This information is listed in Table 5-2, for comparison with previous years. This same information is depicted graphically in Figure 5-1. A computation of closest distance to the best track (right angle error) is also calculated. Right angle error, graphically depicted in Figure 5-2, is a measure of ability to forecast the path of motion without regard to speed. In the Indian Ocean Area, no 72-hour forecasts are available for verification, and no attempt is made to segregate storms by intensity. Error statistics for this area are summarized in Tables 5-2 and 5-3 and Figure 5-3.

TABLE 5-1. JTWC ANNUAL AVERAGE POSITION FORECAST ERROR FOR TROPICAL CYCLONES

	WESTERN NORTH PACIFIC**			INDIAN OCEAN***	
	24-HR	48-HR	72-HR	24-HR	48-HR
1950-58	170	---	---	---	---
1959	*117	*267	---	---	---
1960	177	354	---	---	---
1961	136	274	---	---	---
1962	144	287	476	---	---
1963	127	246	374	---	---
1964	133	284	429	---	---
1965	151	303	418	---	---
1966	136	280	432	---	---
1967	125	276	414	---	---
1968	105	229	337	---	---
1969	111	237	349	---	---
1970	98	181	272	---	---
1971	99	203	308	220	410
1972	116	245	382	193	233
1973	102	193	245	203	305
1974	114	218	351	137	238
1975	129	279	442	145	228
1976	117	232	336	138	204
1977	140	266	390	122	292

*FORECAST POSITIONS NORTH OF 35°N WERE NOT VERIFIED.
**FOR TYPHOONS ONLY WHILE WINDS OVER 35 KNOTS
***1971-1974 DOES NOT INCLUDE ARABIAN SEA

TABLE 5-2. 1977 JTWC ERROR SUMMARY FOR THE WESTERN NORTH PACIFIC

		WARNING			24 HOUR			48 HOUR			72 HOUR		
	CYCLONE	POSIT ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS
1.	TS PATSY	55	36	25	108	77	17	84	54	9	163	127	9
2.	TD 02	20	10	6	167	13	2						
3.	TS RUTH	19	16	14	92	72	10	298	177	6	884	447	2
4.	TD 04	46	31	6	211	70	2						
5.	TY SARAH	22	12	21	119	70	17	121	83	13	129	94	8
6.	TY THELMA	16	9	21	97	58	17	200	134	13	255	157	9
7.	TY VERA	14	8	18	121	72	14	174	123	10	180	162	6
8.	TS WANDA	27	17	17	129	84	13	278	163	9	446	235	5
9.	TS AMY	38	19	16	201	51	12	446	145	8	755	285	3
10.	STY BABE	17	11	36	144	95	32	279	192	28	458	324	23
11.	TS CARLA	53	26	9	112	46	5	274	33	1			
12.	TY DINAH	19	13	38	159	106	34	396	254	30	613	398	25
13.	TS EMMA	32	16	21	200	105	17	365	146	13	431	185	8
14.	TS FREDA	26	14	9	220	82	5	454	146	1			
15.	TY GILDA	39	22	30	130	58	26	198	86	22	295	139	18
16.	TS HARRIET	26	13	19	198	121	15	376	197	11	757	375	7
17.	TY IVY	40	22	24	186	77	20	330	167	16	408	241	12
18.	TY JEAN	27	14	20	239	144	14	489	288	8	1007	775	1
19.	TY KIM	16	10	44	111	57	40	239	129	36	327	186	32
20.	TY LUCY	33	18	39	178	97	34	330	172	30	543	255	27
21.	TY MARY	34	23	59	135	86	55	256	140	47	299	132	33
ALL FORECASTS		29	17	492	148	83	401	283	157	311	407	228	228
TYPHOONS ONLY*		22	14	301	140	80	273	266	156	232	390	232	180

*WHILE WINDS OVER 35 KNOTS

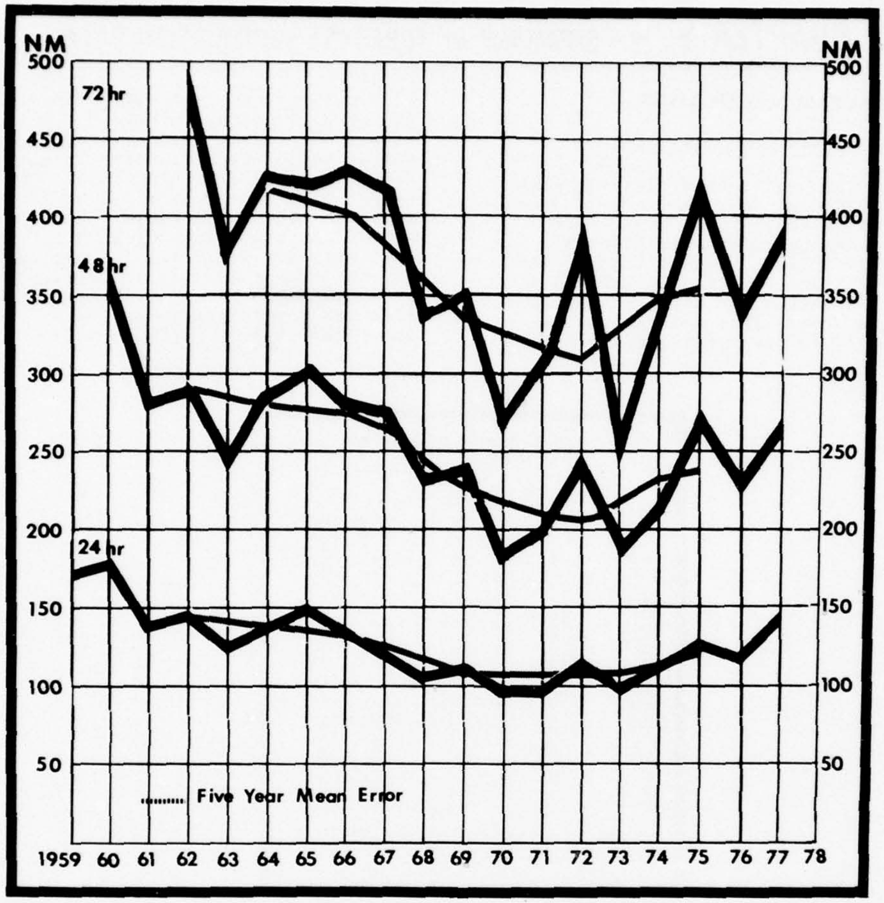


FIGURE 5-1. *Mean vector error for the Pacific Area.*

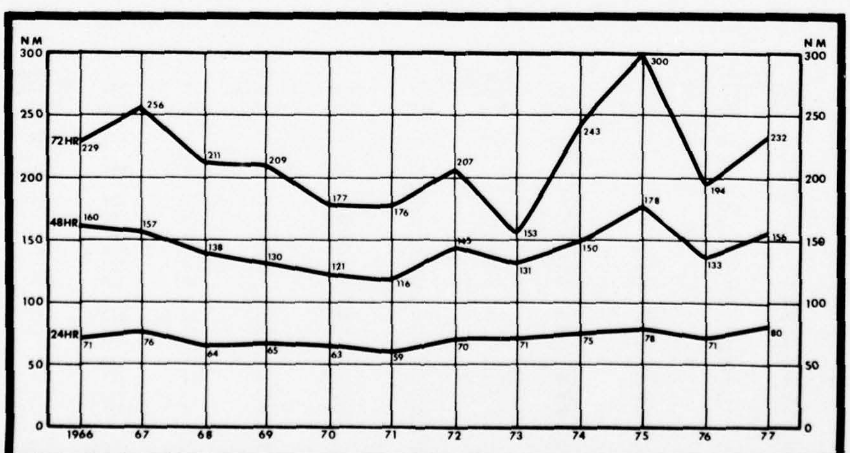


FIGURE 5-2. *Mean right angle error for the Pacific Area.*

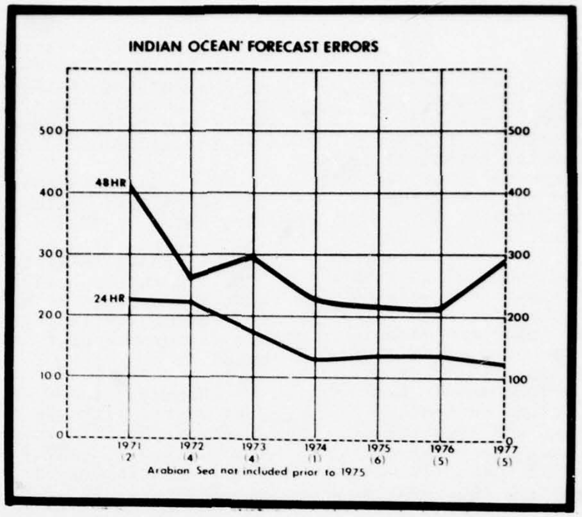


FIGURE 5-3. *Mean vector error for the Indian Ocean Area; number of storms ( ).*

TABLE 5-3. 1977 JTWC ERROR SUMMARY FOR THE NORTH INDIAN OCEAN

	WARNINGS			24 HOUR			48 HOUR		
	POSIT ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS	FCST ERROR	RT ANGLE ERROR	# WRNGS
TC 17-77	31	31	4	127	122	2	---	---	---
TC 18-77	21	21	6	92	85	4	270	250	2
TC 19-77	45	44	5	77	73	3	122	68	1
TC 21-77	41	29	19	153	108	15	371	250	11
TC 22-77	30	29	10	96	74	8	182	161	6
ALL	35	30	44	122	94	32	292	214	20

b. INTENSITY FORECAST VERIFICATION

Intensity verification statistics for tropical cyclones attaining typhoon intensity are depicted in Table 5-4. Adherence to a standardized pressure-height versus wind speed relationship and improved satellite analysis techniques have resulted in a low initial position intensity error (4.8 kt) over the past four seasons. This in turn has contributed to smaller 24-, 48-, and 72-hour intensity forecast deviations from the JTWC best track.

TABLE 5-4. JTWC ANNUAL AVERAGE INTENSITY FORECAST ERROR

	WESTERN NORTH PACIFIC*				INDIAN OCEAN**		
	WARNING POSITION	24-HR	48-HR	72-HR	WARNING POSITION	24-HR	48-HR
1971	7	16	21	24	--	--	--
1972	9	14	20	24	13	15	12
1973	7	16	20	28	8	15	20
1974	4	11	15	20	0	8	18
1975	4	13	18	20	7	14	18
1976	5	12	19	22	5	10	15
1977	6	13	20	23	5	8	23
AVERAGE	6	14	19	23	6	12	18

*FOR TYPHOONS ONLY
**1971-1974 DOES NOT INCLUDE ARABIAN SEA

2. COMPARISON OF OBJECTIVE TECHNIQUES

a. GENERAL

Objective techniques have been verified annually since 1967, however, year-to-year modifications and improvements prevent any long term comparisons of the various techniques. The analog technique provides three movement forecasts, one for straight moving storms, one for recurving storms and one combining the tracks of straight, recurving and other storms that do not meet the criteria as straight or recurving analogs. However, only the combined is listed for verification. The analog technique also provides an intensity forecast for each warning position. The dynamic objective technique employs the steering concept of a point vortex in a smoothed large-scale flow field. A new technique, the tropical cyclone model executes basic equations of motion, computes streamfunctions and displays the location of minimum streamfunction center every six hours to 72 hours. An intensity forecast scheme is based on statistical regression equations of analog storms.

b. DESCRIPTION OF OBJECTIVE TECHNIQUES

(1) TYFN75-Analog program which scans history tapes for storms similar (within a specified acceptance envelope) to the instant storm. Three 24-, 48-, and 72-hour forecasts are provided. In addition, 24-, 48-, and 72-hour intensity forecasts are provided.

(2) MOHATT 700/500-Steering program which advects a point vortex on a preselected analysis or smoothed prognostic fields at the designated upper-levels in 6-hour time steps through 72 hours. Utilizing the previous 12-hour history position, MOHATT computes the 12-hour forecast error and applies a bias correction to the forecast position.

(3) TCM-Tropical Cyclone Forecast Model is coarse mesh (220 km), with the digitized storm warning position bogused at 850 mb level of FNWC Global Band Analysis utilizing wind and temperature fields. Boundary conditions permit no mass transfer across north or south walls, and east/west boundaries are cyclical.

(4) FCSTINT-Intensity forecast program which utilizes statistical regression equations to provide 24-, 48-, and 72-hour forecast intensities.

(5) 12-HR EXTRAPOLATION-A track through current warning position and 12-hour old preliminary best track position is linearly extrapolated to 24 and 48 hours.

(6) HPAC-Mean 24 and 48 hour forecast positions are derived by averaging the 24 and 48 hour positions from the 12-HR EXTRAPOLATION track and a track based on climatology.

(7) INJAH74-Analog program for North Indian Ocean. Similar to TYFN75, except tracks are not segregated.

c. TESTING AND RESULTS

It is of interest to compare the performance of the objective techniques to each other and to the official forecast as well. This information is listed in Table 5-5 for Pacific typhoons only and in Table 5-6 for all Pacific forecasts.

In these tables "X-AXIS" refers to the techniques listed horizontally across the top, while "Y-AXIS refers to those listed vertically. As a matter of explanation, the example shown in Table 5-5 compares TYFC to TCM. In the 75 cases available for comparison, the average 24 hour vector error for TYFC was 136 nm, while that for TCM was 128 nm. The difference of 8 nm is shown in the lower right.

Figure 5-4 compares JTWC intensity forecast errors with the objective technique forecast errors. Only TYFC (TYFN75 combined analog) and FCSTINT intensity forecasts were verified this season. All forecasts were verified against JTWC best track intensities. The number of cases verified were:

FORECAST	24HR	48HR	72HR
JTWC	401	311	228
FCSTINT	312	246	182
TYFC	293	234	172

Statistics are only available for the Pacific area.

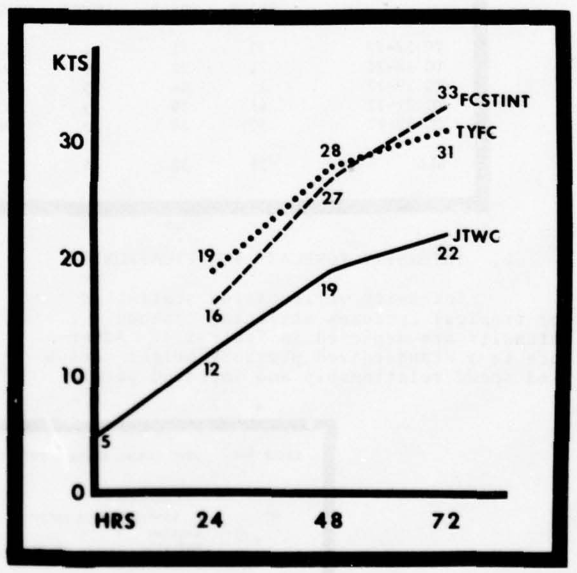


FIGURE 5-4. Comparison of intensity forecast errors for the Pacific area.

TABLE 5-5. 1977 OBJECTIVE TECHNIQUES FOR WESTERN NORTH PACIFIC TYPHOONS (ALL FORECASTS)

24-HOUR

	JTWC	XTRP	HPAC	TCM	TYFC	MH70	MH50
JTWC	303 144 144 0						
XTRP	289 143 149 6	289 149 149 0					
HPAC	278 142 141 -0	278 147 141 -6	278 141 141 0				
TCM	88 138 132 -6	86 137 132 -5	83 132 129 -3	38 132 132 0			
TYFC	246 145 147 2	244 152 147 -5	240 143 147 4	75 128 136 8	246 147 147 0		
MH70	222 141 162 21	220 144 161 17	214 136 160 25	72 127 146 19	197 141 160 19	222 162 162 0	
MH50	189 142 154 12	187 146 154 8	182 136 154 18	67 127 144 17	168 142 158 16	189 159 154 -5	189 154 154 0

NUMBER OF CASES	X-AXIS TECHNIQUE ERROR
Y-AXIS TECHNIQUE ERROR	ERROR DIFFERENCE Y-X

48-HOUR

	JTWC	XTRP	HPAC	TCM	TYFC	MH70	MH50
JTWC	253 275 275 0						
XTRP	242 274 306 33	242 306 306 0					
HPAC	234 270 265 -6	234 302 265 -38	234 265 265 0				
TCM	64 304 255 -49	63 317 257 -60	62 280 256 -25	64 255 255 0			
TYFC	207 277 261 -16	206 316 261 -55	204 264 258 -6	56 245 278 33	207 261 261 0		
MH70	188 274 337 63	187 297 337 40	182 253 335 82	52 236 321 86	168 246 329 82	188 337 337 0	
MH50	158 276 322 46	157 300 322 22	152 253 321 68	49 235 335 100	142 245 324 79	158 333 322 -11	158 322 322 0

JTWC-OFFICIAL JTWC SUBJECTIVE FORECAST
XTRP-12-HOUR EXTRAPOLATION
HPAC-MEAN OF XTRP AND CLIMATOLOGY
TYFC-TYFN75 (WEIGHTED CLIMO) COMBINED
MH70-MOHATT 700-MB PROG
MH50-MOHATT 500-MB PROG
TCM-TROPICAL CYCLONE MODEL

72-HOUR

	JTWC	TCM	TYFC	MH70	MH50
JTWC	194 393 393 0				
TCM	38 509 454 -56	38 454 454 0			
TYFC	161 395 363 32	36 462 445 -16	162 362 362 0		
MH70	137 402 561 160	31 429 557 128	128 364 561 197	142 564 564 0	
MH50	121 407 525 119	29 443 594 151	111 364 527 163	124 543 520 -24	126 520 520 0

TABLE 5-6. 1977 OBJECTIVE TECHNIQUES FOR ALL WESTERN NORTH PACIFIC FORECASTS

24-HOUR

	JTWC	XTRP	HPAC	TCM	TYFC	MH70	MH50
JTWC	401 148 148 0						
XTRP	381 148 155 8	381 155 155 0					
HPAC	366 146 149 3	366 154 149 5	366 149 149 0				
TCM	99 135 138 3	97 136 139 3	93 134 137 3	99 138 138 0			
TYFC	317 152 157 5	315 160 157 2	310 151 157 6	32 134 138 4	317 157 157 0		
MH70	287 145 167 22	283 152 166 15	277 146 166 20	78 138 148 11	252 152 168 16	287 167 167 0	
MH50	245 146 163 17	241 154 162 8	236 146 163 17	73 134 144 10	217 152 157 15	243 167 164 -3	245 163 163 0

48-HOUR

	JTWC	XTRP	HPAC	TCM	TYFC	MH70	MH50
JTWC	311 283 283 0						
XTRP	297 282 318 36	297 318 318 0					
HPAC	288 278 276 -2	288 314 276 -38	288 276 276 0				
TCM	70 290 262 -27	69 307 264 -43	68 275 263 -12	70 262 262 0			
TYFC	251 286 280 -6	250 326 280 -46	248 277 278 1	60 251 274 23	251 280 280 0		
MH70	231 288 352 64	229 318 352 34	224 276 351 76	55 249 327 77	204 275 348 73	231 352 352 0	
MH50	196 290 341 51	194 323 340 17	189 277 340 63	58 247 336 89	176 276 342 66	194 353 343 -10	196 341 341 0

JTWC-OFFICIAL JTWC SUBJECTIVE FORECAST
XTRP-12-HOUR EXTRAPOLATION
HPAC-MEAN OF XTRP AND CLIMATOLOGY
TYFC-TYFN-TYFN75 (WEIGHTED CLIMO) COMBINED
MH70-MOHATT 700-MB PROG
MH50-MOHATT 500-MB PROG
TCM-TROPICAL CYCLONE MODEL

72-HOUR

	JTWC	TCM	TYFC	MH70	MH50
JTWC	228 407 407 0				
TCM	39 505 450 -56	39 450 450 0			
TYFC	184 412 392 -20	37 457 448 -9	185 391 391 0		
MH70	156 421 580 159	32 425 548 123	146 394 576 181	162 583 583 0	
MH50	138 424 555 131	30 439 590 151	127 397 553 156	142 569 551 -18	144 551 551 0

3. EVALUATION OF THE TROPICAL CYCLONE MODEL (TCM)

a. BACKGROUND

A primitive equation tropical cyclone forecast model based on original work by Harrison and Elsberry and developed by the Naval Environmental Prediction Research Facility and Fleet Numerical Weather Central (FNWC) was introduced for testing during the 1976 tropical cyclone season. The model is a four level, coarse mesh (horizontal grid increment nominally 200 km), limited area (28 grid points east-west, 20 grid points north-south), five parameter model with cyclical boundary conditions on the longitudinal boundaries and no-flux conditions on the latitudinal boundaries. Initial conditions are provided by the FNWC Global Band NVA model. No interaction with large scale models occurs during the forecast period. In August 1977, a "bias input vector" based on JTWC's 12 hour direction and speed of movement forecast was incorporated in an effort to improve initial movement accuracy.

During 1977, the TCM was operable using the 0000Z or 1200Z data bases when tropical cyclone intensity was 50 kts or greater. The official 0000Z and 1200Z JTWC warning positions were used in the initialization of the TCM. Final TCM output was received at JTWC approximately 10 1/2 hours after data base time.

b. COMPARISON OF TCM TO BEST TRACK

Table 5-7 summarizes the mean vector errors of the TCM 24, 48 and 72 hour forecast positions as compared to corresponding best track positions. Sample size was limited by several factors including:

1. TCM was run no more than twice daily and only when tropical cyclone intensity was greater than or equal to 50 kt.

2. A low number of storms occurred in WESTPAC during 1977.

3. TCM was often unable to track a storm to 72 hours, therefore output was not complete. Reasons included model boundary limitations and loss of clear definition of center location with time.

c. TCM VERSUS JTWC

Analysis of the mean vector errors of the 1977 tropical cyclone forecasts revealed that the TCM forecasts beyond 24 hours significantly improved upon the official JTWC forecast used in the model initialization. This is depicted in Figure 5-5 (TCM vs. JTWC, same warning time).

The TCM had an advantage over the JTWC forecast for the same warning time. It used the JTWC forecast for initialization, then added the synoptic data (0000Z or 1200Z) analysis which was unavailable to JTWC forecasters prior to warning issuance.

A similar comparison was made between the TCM forecasts and the official JTWC warning produced after receipt of the TCM output at JTWC. Both forecasts had access to the same data base. JTWC also had the TCM output, recent fix data and other aids. Figure 5-5 portrays the JTWC forecast significantly improving on the TCM (same data base).

In the latter comparison, a JTWC 0000Z + 24 hour forecast was matched against the corresponding TCM 1200Z + 36 hour forecast; a JTWC 0000Z + 48 hour forecast was matched against the corresponding TCM 1200Z + 60 hour forecast. A match was not possible for the JTWC 72 hour forecast since the TCM did not provide output beyond 72 hours.

The sample size was insufficient to determine how well the TCM forecast erratic movement or recurvature versus nonrecurvature.

d. CONCLUSION

It appears that use of the TCM as an aid to the official JTWC forecast will improve the forecast. More stringent testing is planned for the 1978 tropical cyclone season.

TABLE 5-7. 1977 TCM 24, 48, AND 72 HOUR FORECAST MEAN VECTOR ERRORS

	24 HR	48 HR	72 HR
ALL TROPICAL CYCLONES	138 NM	262 NM	450 NM
NO. OF CASES	99	70	39
TYPHOONS ONLY	132 NM	255 NM	454 NM
NO. OF CASES	88	64	38

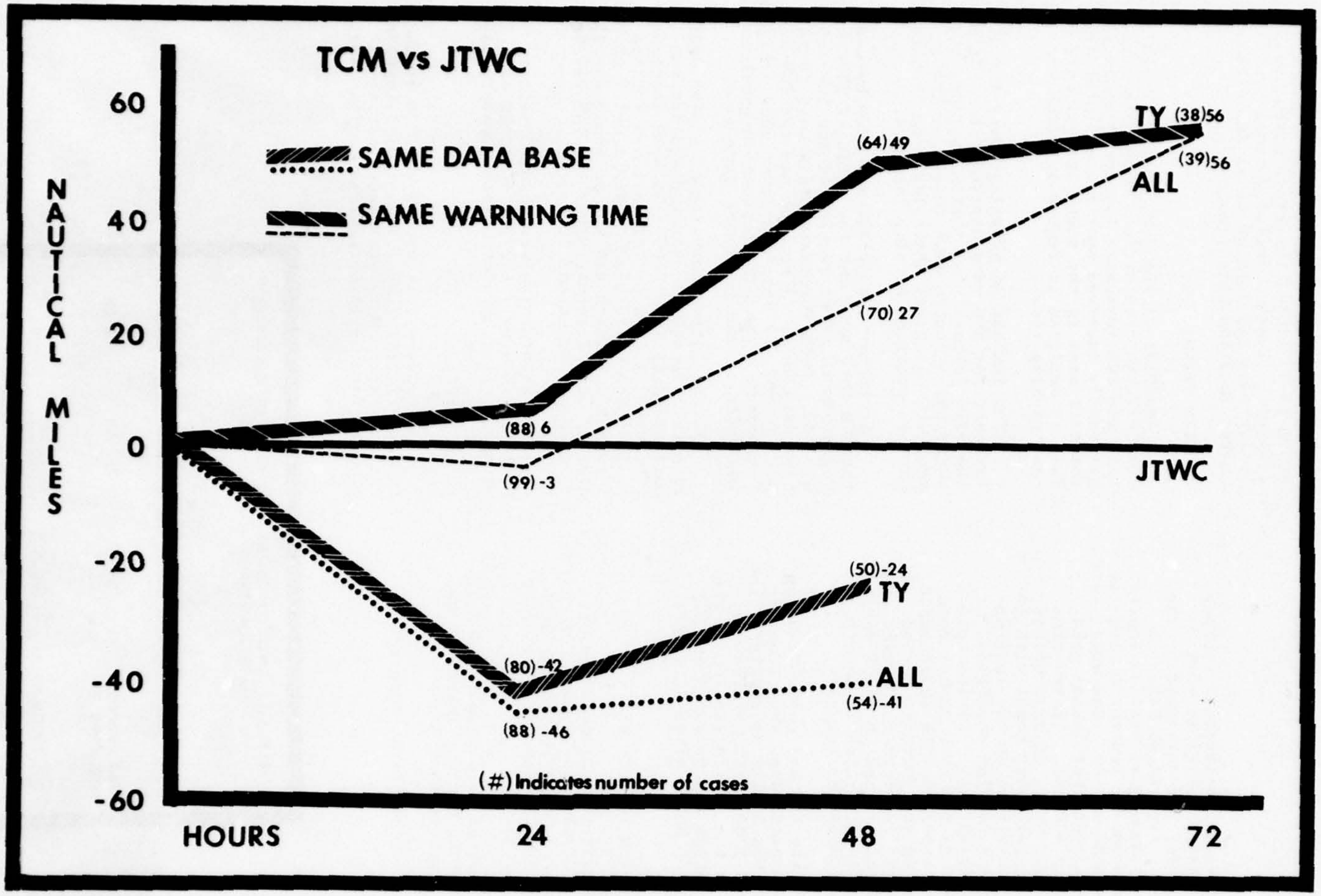


FIGURE 5-5. Comparison of position forecast errors between the TCM and JTWC. The TCM is compared relative to JTWC which is represented by the zero nautical mile line. Comparisons are shown for typhoons (TY) and all tropical cyclones (ALL). (Positive Y-axis values indicate TCM improves JTWC forecasts.)

4. PACIFIC AREA TROPICAL STORM AND DEPRESSION DATA

TROPICAL STORM PATSY

0600Z 23 MAR TO 0000Z 31 MAR

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
230600Z	3.3N 164.2E	30	2.8N 164.8E	25	47	-5	3.5N 163.0E	35	132	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	4.1N 164.2E	30	3.2N 163.7E	25	61	-5	4.7N 160.7E	30	285	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231800Z	4.0N 165.0E	30	3.6N 162.9E	25	127	-5	5.1N 159.7E	30	351	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240000Z	3.5N 165.2E	25	3.8N 165.2E	25	18	0	5.2N 164.4E	25	144	10	--.- ---.-	--	--	--	8.4N 160.2E	35	189	0
240600Z	3.2N 165.2E	20	3.9N 164.8E	30	48	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	8.1N 162.8E	40	283	0
241200Z	3.1N 165.2E	15	3.9N 164.9E	30	51	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	8.1N 162.9E	40	280	-5
241800Z	3.0N 165.2E	15	4.0N 164.9E	30	62	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	8.2N 162.9E	40	274	-10
250000Z	2.9N 165.1E	15	4.2N 164.9E	25	79	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	3.4N 161.2E	35	3.5N 161.5E	30	19	-5	5.1N 159.9E	40	81	-10	6.2N 157.9E	45	115	15	7.2N 155.9E	50	122	30
270600Z	3.9N 160.6E	40	3.9N 160.5E	30	6	-10	5.1N 158.5E	40	79	-5	6.2N 156.5E	45	96	20	7.1N 154.4E	50	104	30
271200Z	4.4N 160.0E	45	4.2N 159.8E	30	17	-15	5.7N 157.3E	40	61	0	7.1N 154.4E	45	78	25	8.1N 151.8E	55	87	40
271800Z	5.2N 159.4E	50	4.6N 159.3E	30	36	-20	6.1N 156.7E	40	54	5	7.4N 153.9E	50	76	30	8.4N 151.3E	60	77	45
280000Z	5.9N 158.8E	50	5.3N 158.9E	50	36	0	7.3N 156.4E	65	6	35	8.4N 153.7E	70	36	50	9.2N 151.0E	70	54	55
280600Z	6.4N 158.3E	45	6.1N 158.3E	50	18	5	7.8N 155.5E	65	17	40	8.9N 152.4E	70	78	50	--.- ---.-	--	--	--
281200Z	6.7N 157.5E	40	6.6N 158.1E	50	36	10	8.6N 155.0E	65	38	45	10.1N 152.8E	75	80	60	--.- ---.-	--	--	--
281800Z	7.0N 156.8E	35	7.2N 157.1E	45	21	10	9.1N 154.0E	50	67	30	10.4N 151.1E	65	122	50	--.- ---.-	--	--	--
290000Z	7.3N 156.3E	30	7.3N 156.4E	50	6	20	8.8N 153.5E	55	51	35	10.0N 151.0E	65	80	50	--.- ---.-	--	--	--
290600Z	7.6N 155.7E	25	7.7N 155.7E	35	6	10	9.1N 152.8E	35	58	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
291200Z	8.2N 155.1E	20	8.4N 154.3E	35	117	15	9.9N 151.3E	35	125	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
291800Z	8.3N 154.8E	20	9.2N 153.3E	35	104	15	10.9N 150.5E	35	168	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
300000Z	8.5N 154.3E	20	8.8N 153.4E	35	56	15	10.7N 150.7E	35	124	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
300600Z	8.7N 153.7E	20	9.4N 152.0E	30	109	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
301200Z	8.8N 153.1E	15	9.5N 151.9E	30	82	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
301800Z	8.9N 152.5E	15	9.6N 151.5E	30	72	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310000Z	9.0N 151.9E	15	10.0N 149.6E	25	148	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	55NM	108NM	84NM	163NM
AVERAGE RIGHT ANGLE ERROR	36NM	77NM	54NM	127NM
AVERAGE MAGNITUDE OF WIND ERROR	11KTS	20KTS	39KTS	24KTS
AVERAGE BIAS OF WIND ERROR	5KTS	18KTS	39KTS	21KTS
NUMBER OF FORECASTS	25	17	9	9

TROPICAL DEPRESSION 02

0000Z 26 MAY TO 0600Z 27 MAY

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
260000Z	19.8N 129.3E	30	19.7N 128.9E	30	23	0	21.4N 129.3E	35	206	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	21.1N 129.1E	30	20.4N 129.0E	30	42	0	23.7N 130.7E	35	128	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261200Z	22.2N 129.6E	30	21.8N 129.4E	30	26	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261800Z	23.3N 130.2E	30	23.2N 129.9E	30	18	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	24.6N 130.7E	30	24.5N 130.6E	30	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270600Z	25.6N 131.8E	25	25.6N 131.9E	25	5	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	20NM	167NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	10NM	13NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	0KTS	8KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	0KTS	8KTS	0KTS	0KTS
NUMBER OF FORECASTS	6	2	0	0

TROPICAL STORM RUTH

0600Z 14 JUN TO 1200Z 17 JUN

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
140600Z	16.0N 116.9E	40	15.7N 116.4E	30	34	-10	17.9N 113.7E	45	189	-15	19.0N 111.0E	50	471	10	19.7N 108.2E	40	875	15
141200Z	16.8N 116.6E	50	16.6N 116.7E	35	13	-15	18.8N 114.2E	45	176	-10	19.7N 111.5E	50	484	10	20.6N 109.1E	50	893	30
141800Z	17.7N 116.4E	55	17.3N 116.1E	35	29	-20	19.4N 113.7E	45	223	-5	20.4N 111.0E	50	552	15	--.- ---.-	--	--	--
150000Z	18.6N 116.4E	60	18.5N 116.6E	60	13	0	22.0N 117.7E	55	12	10	25.5N 119.5E	50	80	20	--.- ---.-	--	--	--
150600Z	19.3N 116.7E	60	19.5N 117.1E	60	26	0	22.9N 119.2E	50	65	10	25.8N 122.0E	45	109	20	--.- ---.-	--	--	--
151200Z	20.1N 117.0E	55	20.2N 117.0E	60	6	5	23.7N 118.6E	55	36	15	26.9N 122.4E	45	94	25	--.- ---.-	--	--	--
151800Z	21.0N 117.3E	50	21.0N 117.4E	60	6	10	24.5N 119.8E	50	50	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	22.2N 117.7E	45	22.1N 117.6E	55	8	10	25.7N 120.7E	45	42	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160600Z	23.3N 118.1E	40	23.2N 118.3E	55	12	15	26.9N 122.2E	45	50	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	24.3N 118.7E	40	24.0N 119.2E	55	33	15	27.0N 123.1E	45	78	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161800Z	25.3N 119.5E	35	24.8N 119.5E	50	30	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170000Z	26.4N 120.6E	30	26.8N 120.5E	40	24	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170600Z	27.6N 121.7E	25	27.4N 121.8E	35	13	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
171200Z	28.3N 123.2E	20	28.5N 123.5E	25	20	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	19NM	92NM	298NM	884NM
AVERAGE RIGHT ANGLE ERROR	16NM	72NM	177NM	447NM
AVERAGE MAGNITUDE OF WIND ERROR	10KTS	14KTS	17KTS	23KTS
AVERAGE BIAS OF WIND ERROR	4KTS	8KTS	17KTS	23KTS
NUMBER OF FORECASTS	14	10	6	2

TROPICAL DEPRESSION 04

0000Z 05 JUL TO 0600Z 06 JUL

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
050000Z	17.7N 113.6E	30	17.9N 114.1E	25	31	-5	19.7N 112.2E	45	181	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
050600Z	18.7N 112.5E	30	17.7N 112.8E	30	62	0	18.3N 109.6E	40	242	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051200Z	19.8N 111.8E	30	19.3N 111.5E	30	34	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
051800Z	20.4N 110.5E	25	19.5N 110.9E	25	58	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060000Z	21.2N 109.4E	20	21.1N 109.9E	25	28	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060600Z	22.3N 109.1E	20	21.6N 109.9E	25	61	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	46NM	211NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	31NM	70NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	23KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	1KTS	23KTS	0KTS	0KTS
NUMBER OF FORECASTS	6	2	0	0

TROPICAL STORM WANDA

0600Z 31 JUL TO 0600Z 04 AUG

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
310600Z	23.5N 140.9E	30	23.2N 140.8E	30	19	0	23.8N 141.3E	40	126	5	24.0N 141.9E	50	169	15	26.0N 142.0E	60	287	15
311200Z	24.0N 140.9E	30	23.8N 140.5E	30	25	0	24.8N 140.4E	40	103	5	26.2N 138.7E	50	245	15	27.2N 135.8E	60	520	20
311800Z	24.5N 140.8E	30	25.0N 141.2E	30	37	0	26.6N 140.7E	40	36	5	27.7N 139.3E	50	221	10	28.2N 136.9E	60	483	25
010000Z	25.1N 140.6E	35	24.5N 140.3E	40	39	5	26.4N 139.8E	55	84	20	28.7N 139.3E	65	232	20	31.4N 138.7E	75	388	45
010600Z	25.7N 140.3E	35	26.3N 140.1E	45	37	10	28.5N 138.0E	60	155	25	31.4N 137.1E	70	369	25	34.0N 136.2E	80	553	50
011200Z	26.5N 140.7E	35	26.8N 140.5E	45	21	10	29.0N 139.9E	55	146	20	31.7N 138.8E	60	325	20	--.- ---.-	--	--	--
011800Z	27.2N 140.8E	35	27.3N 140.9E	40	8	5	29.7N 140.0E	50	170	10	32.3N 139.0E	55	353	20	--.- ---.-	--	--	--
020000Z	27.7N 140.4E	35	28.0N 140.3E	40	19	5	31.1N 139.5E	50	216	5	33.7N 140.0E	45	351	15	--.- ---.-	--	--	--
020600Z	27.7N 141.4E	35	27.5N 140.5E	30	49	-5	29.0N 140.7E	35	200	-10	31.2N 142.2E	40	235	10	--.- ---.-	--	--	--
021200Z	28.4N 142.6E	35	28.5N 142.6E	30	6	-5	30.5N 145.0E	35	0	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	29.1N 143.2E	40	28.8N 142.9E	30	24	-10	30.8N 145.1E	40	31	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	30.0N 143.5E	45	30.3N 143.8E	35	24	-10	34.6N 146.6E	40	205	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030600Z	30.4N 144.2E	45	31.0N 144.2E	35	36	-10	34.9N 146.9E	40	203	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	30.5N 145.0E	40	30.6N 143.9E	35	57	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031800Z	30.8N 145.7E	35	30.1N 146.0E	35	45	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040000Z	31.2N 146.3E	30	31.3N 146.3E	30	6	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040600Z	31.5N 146.8E	30	31.6N 146.8E	30	6	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	27NM	129NM	278NM	446NM
AVERAGE RIGHT ANGLE ERROR	17NM	84NM	163NM	235NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	10KTS	17KTS	31KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	8KTS	17KTS	31KTS
NUMBER OF FORECASTS	17	13	9	5

TROPICAL STORM AMY

0000Z 20 AUG TO 1800Z 23 AUG

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
200000Z	20.6N 120.6E	25	20.7N 120.6E	30	6	5	20.8N 117.3E	40	28	10	21.4N 114.2E	45	339	15	22.6N 111.7E	40	854	10
200600Z	20.9N 119.8E	30	20.7N 120.3E	30	30	0	21.3N 118.1E	40	25	10	22.4N 115.3E	45	300	15	23.8N 113.2E	35	831	-5
201200Z	21.0N 119.0E	30	21.4N 120.0E	35	61	5	23.3N 119.3E	45	66	15	25.2N 118.7E	40	115	10	26.9N 117.8E	30	581	-10
201800Z	20.4N 118.3E	30	21.3N 119.2E	35	74	5	22.7N 117.7E	40	99	10	24.4N 116.4E	30	302	0	--.- ---.-	--	--	--
210000Z	20.8N 117.8E	30	20.4N 118.3E	30	37	0	21.3N 117.6E	30	183	0	22.5N 116.4E	35	658	5	--.- ---.-	--	--	--
210600Z	21.7N 118.2E	30	21.4N 119.5E	30	74	0	23.1N 119.6E	35	79	5	24.8N 119.5E	35	522	-5	--.- ---.-	--	--	--
211200Z	22.3N 118.8E	30	22.3N 119.1E	30	17	0	24.4N 118.3E	30	139	0	26.3N 118.1E	30	587	-10	--.- ---.-	--	--	--
211800Z	22.8N 119.5E	30	22.3N 119.0E	30	41	0	23.0N 118.3E	35	250	5	24.7N 117.2E	25	744	-15	--.- ---.-	--	--	--
220000Z	23.5N 119.9E	30	23.3N 119.2E	30	40	0	25.2N 118.5E	30	464	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220600Z	24.2N 120.4E	30	24.2N 119.8E	30	33	0	26.9N 120.3E	35	409	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221200Z	24.9N 120.8E	30	24.7N 120.4E	30	25	0	27.2N 121.7E	35	404	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221800Z	25.7N 121.8E	30	25.8N 121.5E	30	17	0	29.4N 126.3E	35	274	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230000Z	30.1N 125.3E	30	29.0N 124.5E	30	78	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	30.7N 126.8E	40	30.5N 126.5E	30	20	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	31.7N 127.5E	40	31.7N 127.2E	30	15	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231800Z	31.7N 128.9E	40	32.5N 128.7E	30	49	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	38NM	201NM	446NM	755NM
AVERAGE RIGHT ANGLE ERROR	19NM	51NM	145NM	285NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	6KTS	9KTS	8KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	3KTS	2KTS	-2KTS
NUMBER OF FORECASTS	16	12	8	3

TROPICAL STORM CARLA

0000Z 03 SEP TO 0000Z 05 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
030000Z	18.5N 114.3E	30	17.7N 114.7E	30	53	0	18.1N 111.2E	40	74	5	18.0N 108.7E	50	274	30	--.- ---.-	--	--	--
030600Z	18.4N 113.3E	30	18.0N 113.6E	30	29	0	18.1N 110.2E	40	111	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	18.2N 112.3E	35	18.0N 112.2E	35	13	0	18.3N 108.2E	40	108	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031800Z	17.8N 111.2E	35	18.0N 111.2E	35	12	0	18.7N 107.3E	40	152	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040000Z	17.6N 110.0E	35	17.8N 110.1E	35	13	0	17.8N 105.8E	30	113	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
040600Z	17.4N 108.4E	35	17.8N 109.6E	35	72	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041200Z	17.2N 106.7E	30	17.9N 108.3E	35	100	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
041800Z	17.0N 105.3E	20	18.0N 107.3E	35	129	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
050000Z	17.0N 104.0E	20	17.0N 105.0E	25	57	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	53NM	112NM	274NM	0NM
AVERAGE RIGHT ANGLE ERROR	26NM	46NM	33NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	10KTS	30KTS	0KTS
AVERAGE BIAS OF WIND ERROR	3KTS	10KTS	30KTS	0KTS
NUMBER OF FORECASTS	9	5	1	0

TROPICAL STORM EMMA

0600Z 15 SEP TO 0600Z 20 SEP

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
150600Z	21.2N 143.4E	40	21.1N 142.7E	30	39	-10	22.4N 140.9E	45	275	-5	24.2N 139.2E	60	367	0	25.3N 136.4E	75	369	25
151200Z	22.4N 143.8E	40	22.2N 143.8E	40	12	0	26.1N 143.4E	55	51	0	28.4N 140.0E	65	228	10	29.6N 135.9E	75	260	25
151800Z	23.6N 144.1E	40	23.3N 144.3E	40	21	0	26.9N 145.1E	55	43	0	29.2N 142.2E	65	68	15	29.8N 137.7E	75	152	25
160000Z	24.8N 144.3E	45	24.8N 144.9E	40	33	-5	29.7N 145.9E	50	164	-10	34.8N 147.2E	55	410	5	34.3N 150.0E	55	628	10
160600Z	25.8N 144.3E	50	25.6N 144.0E	45	20	-5	30.9N 144.4E	55	161	-5	35.9N 147.1E	50	479	0	40.2N 151.0E	50	614	5
161200Z	26.4N 144.3E	55	27.0N 144.4E	50	36	-5	32.3N 145.8E	50	212	-5	36.9N 149.2E	50	588	0	39.8N 154.8E	45	654	5
161800Z	26.9N 144.3E	55	27.7N 144.9E	50	57	-5	31.8N 146.4E	45	211	-5	36.0N 149.5E	40	547	-10	--.- ---.-	--	--	--
170000Z	27.3N 144.4E	60	27.1N 144.3E	50	13	-10	29.0N 143.9E	50	63	0	31.4N 143.9E	45	197	0	34.0N 143.2E	40	355	0
170600Z	28.2N 144.4E	60	27.9N 144.4E	50	18	-10	30.4N 143.6E	50	118	0	33.5N 143.0E	45	124	0	37.0N 143.8E	40	416	5
171200Z	29.0N 144.3E	55	28.6N 144.1E	50	26	-5	31.2N 143.4E	50	150	0	34.4N 143.0E	45	67	5	--.- ---.-	--	--	--
171800Z	29.3N 143.5E	50	29.5N 143.9E	50	24	0	32.8N 143.1E	50	178	0	36.2N 143.4E	45	60	5	--.- ---.-	--	--	--
180000Z	29.1N 142.7E	50	28.8N 142.2E	50	32	0	30.0N 139.7E	50	146	5	31.3N 136.3E	50	680	10	--.- ---.-	--	--	--
180600Z	29.3N 141.7E	50	29.1N 141.7E	50	12	0	30.3N 138.9E	50	243	5	31.4N 135.5E	50	933	15	--.- ---.-	--	--	--
181200Z	29.9N 140.9E	50	29.5N 141.0E	50	24	0	30.6N 138.1E	50	348	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
181800Z	31.0N 140.3E	50	30.1N 140.4E	50	54	0	33.0N 137.8E	50	394	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190000Z	32.4N 140.2E	45	32.4N 140.2E	50	0	5	37.4N 141.5E	50	245	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190600Z	34.1N 140.6E	45	33.7N 140.4E	45	26	0	38.3N 142.5E	40	398	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	35.3N 142.2E	40	35.2N 141.4E	45	39	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	36.9N 144.3E	40	36.3N 143.6E	45	49	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	39.5N 146.0E	40	39.0N 146.0E	40	30	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	42.6N 149.2E	35	41.0N 148.0E	40	109	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	32NM	200NM	365NM	431NM
AVERAGE RIGHT ANGLE ERROR	16NM	105NM	146NM	185NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	4KTS	6KTS	13KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	1KTS	4KTS	13KTS
NUMBER OF FORECASTS	21	17	13	8

TROPICAL STORM FREDA

0000Z 23 SEP TO 0000Z 25 SEP

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
230000Z	18.2N 124.3E	30	18.0N 124.0E	30	21	0	20.4N 120.6E	40	239	-5	21.9N 118.0E	50	454	15	--.- ---.-	--	--	--
230600Z	18.8N 122.4E	30	18.7N 122.8E	30	23	0	20.7N 119.3E	40	254	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	19.2N 120.5E	30	19.7N 120.5E	30	30	0	21.9N 116.9E	40	220	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231800Z	19.3N 118.5E	40	19.3N 119.0E	50	28	10	21.1N 115.2E	60	219	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240000Z	19.7N 116.6E	45	19.6N 117.1E	55	29	10	20.3N 112.0E	60	167	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
240600Z	20.2N 114.8E	50	19.6N 115.6E	55	57	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241200Z	20.9N 113.1E	55	21.2N 113.5E	55	29	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241800Z	21.6N 111.3E	45	21.7N 111.5E	50	13	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	22.2N 109.8E	35	22.1N 109.9E	35	8	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

ALL FORECASTS	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	26NM	220NM	454NM	0NM
AVERAGE RIGHT ANGLE ERROR	14NM	82NM	146NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	3KTS	14KTS	15KTS	0KTS
AVERAGE BIAS OF WIND ERROR	3KTS	2KTS	15KTS	0KTS
NUMBER OF FORECASTS	9	5	1	0

TROPICAL STORM HARRIET

0600Z 16 OCT TO 1800Z 20 OCT

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR FORECAST WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR FORECAST WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR FORECAST WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
160600Z	15.8N 135.1E	35	15.7N 135.0E	30	8	-5	16.9N 129.2E	50	156	5	17.9N 124.7E	60	462	10	18.7N 120.6E	65	985	15
161200Z	16.3N 134.0E	35	16.3N 134.2E	30	11	-5	17.4N 128.7E	40	172	-5	17.4N 124.0E	50	538	0	17.5N 120.3E	55	1154	0
161800Z	17.0N 133.3E	40	16.3N 133.1E	30	43	-10	16.8N 128.0E	40	260	-10	17.3N 123.6E	50	654	0	17.4N 119.4E	50	1268	0
170000Z	17.5N 132.5E	40	17.4N 132.5E	35	6	-5	20.2N 129.6E	45	179	-5	23.5N 128.9E	55	342	5	27.4N 132.0E	60	428	15
170600Z	17.7N 131.8E	45	17.9N 131.7E	45	13	0	20.7N 129.1E	60	202	10	24.2N 129.3E	65	403	15	28.0N 132.4E	65	479	25
171200Z	18.2N 131.6E	45	18.3N 131.3E	45	18	0	20.7N 129.1E	60	202	10	24.2N 129.3E	65	514	10	28.1N 132.5E	65	580	25
171800Z	18.5N 132.2E	50	18.1N 132.2E	45	24	-5	21.7N 132.5E	60	100	10	24.8N 134.9E	65	326	15	27.8N 139.0E	60	407	25
180000Z	19.2N 132.6E	50	19.0N 132.4E	50	16	0	22.5N 132.8E	65	198	15	25.4N 135.7E	65	327	20	--.- ---.-	--	--	--
180600Z	19.9N 132.6E	50	20.4N 132.6E	55	30	5	24.5N 134.3E	65	171	15	27.8N 138.6E	55	189	15	--.- ---.-	--	--	--
181200Z	21.1N 132.7E	50	21.2N 132.8E	55	8	5	24.8N 134.8E	60	259	5	28.0N 139.3E	50	245	10	--.- ---.-	--	--	--
181800Z	23.1N 133.5E	50	23.2N 133.5E	50	6	0	27.1N 137.7E	40	127	-10	30.0N 143.6E	40	140	5	--.- ---.-	--	--	--
190000Z	25.2N 134.9E	50	24.4N 134.2E	50	61	0	27.8N 138.6E	40	119	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
190600Z	26.8N 136.2E	50	26.8N 136.1E	50	5	0	31.5N 145.4E	40	231	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191200Z	28.2N 137.8E	55	28.6N 138.7E	50	53	-5	33.4N 149.5E	40	370	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
191800Z	29.0N 138.8E	50	29.3N 138.7E	50	19	0	33.8N 147.3E	40	221	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	29.5N 139.8E	45	30.4N 140.4E	50	62	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	29.9N 141.3E	40	30.0N 140.9E	50	22	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201200Z	30.0N 143.4E	40	30.1N 142.8E	45	32	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201800Z	30.2N 146.3E	35	30.6N 145.2E	45	61	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

ALL FORECASTS	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	26NM	198NM	376NM	757NM
AVERAGE RIGHT ANGLE ERROR	13NM	121NM	197NM	375NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	7KTS	10KTS	15KTS
AVERAGE BIAS OF WIND ERROR	0KTS	3KTS	10KTS	15KTS
NUMBER OF FORECASTS	19	15	11	7

5. PACIFIC AREA TYPHOON DATA

TYPHOON SARAH

1200Z 16 JUL TO 1200Z 21 JUL

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
161200Z	10.5N 128.1E	30	10.4N 128.4E	25	19	-5	12.4N 123.6E	35	69	-5	14.3N 119.2E	45	109	-5	16.2N 114.6E	55	109	-5
161800Z	11.2N 126.4E	35	11.0N 127.3E	30	54	-5	12.8N 122.7E	35	93	-5	14.7N 118.0E	45	130	-5	16.6N 113.3E	55	74	-15
170000Z	12.2N 125.2E	40	12.0N 125.5E	35	21	-5	14.9N 119.6E	35	62	-5	18.2N 115.2E	45	68	-5	21.4N 111.6E	40	222	-35
170600Z	13.1N 124.4E	40	12.8N 124.4E	35	18	-5	15.8N 119.1E	35	34	-10	18.7N 114.6E	50	100	-5	22.4N 110.7E	30	241	-45
171200Z	13.4N 123.2E	40	13.5N 123.1E	40	8	0	15.8N 117.7E	50	35	0	18.0N 113.3E	55	51	-5	20.5N 110.2E	45	74	-25
171800Z	14.2N 122.0E	40	13.9N 122.2E	40	21	0	16.2N 118.2E	50	78	0	18.3N 114.3E	60	126	-10	20.8N 111.2E	45	123	-25
180000Z	15.3N 120.8E	40	15.4N 121.5E	40	41	0	17.5N 117.6E	50	133	0	19.9N 113.7E	60	166	-15	21.3N 109.8E	55	98	-10
180600Z	15.8N 119.7E	45	16.0N 120.5E	40	47	-5	18.5N 116.4E	55	155	0	20.4N 112.4E	55	137	-20	21.8N 108.3E	40	94	-20
181200Z	15.9N 118.3E	50	16.4N 118.4E	45	30	-5	18.9N 112.8E	55	102	-5	21.8N 108.3E	40	193	-30	--.- ---.-	--	--	--
181800Z	16.6N 116.9E	50	16.5N 116.8E	45	8	-5	18.8N 111.2E	50	104	-20	20.7N 106.6E	40	178	-30	--.- ---.-	--	--	--
190000Z	17.1N 115.5E	50	17.3N 115.7E	50	17	0	19.7N 111.7E	45	120	-30	21.7N 109.2E	40	98	-25	--.- ---.-	--	--	--
190600Z	17.1N 114.1E	55	17.1N 113.7E	60	23	5	18.3N 108.0E	50	182	-25	21.0N 105.0E	35	125	-25	--.- ---.-	--	--	--
191200Z	17.2N 113.0E	60	17.2N 112.5E	60	29	0	18.7N 107.3E	50	184	-20	21.0N 104.0E	25	96	-10	--.- ---.-	--	--	--
191800Z	17.4N 112.3E	70	17.3N 112.4E	60	8	-10	17.5N 109.9E	55	122	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200000Z	17.7N 111.9E	75	17.7N 112.1E	75	11	0	17.9N 109.7E	70	153	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
200600Z	18.4N 111.2E	75	18.3N 111.5E	75	18	0	20.2N 109.2E	45	114	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201200Z	19.3N 110.5E	70	19.7N 110.6E	70	25	0	24.3N 109.6E	25	280	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
201800Z	19.5N 109.5E	70	19.4N 109.7E	60	13	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210000Z	20.2N 108.5E	65	20.2N 108.7E	60	11	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
210600Z	20.6N 107.2E	60	20.7N 107.5E	60	18	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211200Z	21.3N 105.7E	35	21.1N 105.9E	50	16	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	22NM	119NM	121NM	129NM	22NM	119NM	121NM	129NM
AVERAGE RIGHT ANGLE ERROR	12NM	70NM	83NM	94NM	12NM	70NM	83NM	94NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	10KTS	15KTS	23KTS	4KTS	10KTS	15KTS	23KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	-9KTS	-15KTS	-23KTS	-2KTS	-9KTS	-15KTS	-23KTS
NUMBER OF FORECASTS	20	17	13	8	21	17	13	8

TYPHOON THELMA

0000Z 21 JUL TO 0000Z 26 JUL

	BEST TRACK POSIT	BEST TRACK WIND	WARNING POSIT	WARNING WIND	WARNING ERRORS DST	WARNING ERRORS WIND	24 HOUR FORECAST POSIT	24 HOUR WIND	24 HOUR ERRORS DST	24 HOUR ERRORS WIND	48 HOUR FORECAST POSIT	48 HOUR WIND	48 HOUR ERRORS DST	48 HOUR ERRORS WIND	72 HOUR FORECAST POSIT	72 HOUR WIND	72 HOUR ERRORS DST	72 HOUR ERRORS WIND
210000Z	14.6N 130.1E	30	14.7N 130.2E	30	8	0	16.6N 127.6E	45	37	-5	18.4N 124.8E	50	78	-20	20.1N 122.1E	60	84	-25
210600Z	15.1N 129.0E	35	15.3N 129.4E	30	26	-5	17.4N 126.3E	40	48	-10	19.3N 123.2E	50	78	-30	21.0N 120.0E	60	66	-25
211200Z	15.6N 128.1E	40	15.8N 128.1E	45	12	5	17.8N 124.2E	60	87	0	19.9N 121.2E	70	103	-10	22.3N 118.9E	75	122	-10
211800Z	15.8N 127.7E	45	15.8N 127.6E	50	6	5	17.1N 124.5E	60	8	-5	18.4N 121.7E	70	38	-10	20.1N 119.0E	80	84	0
220000Z	16.2N 127.1E	50	16.0N 127.6E	50	31	0	16.4N 126.6E	60	173	-10	17.5N 124.0E	70	225	-15	19.3N 120.2E	75	173	-5
220600Z	16.6N 126.3E	50	16.5N 126.5E	50	13	0	17.3N 124.0E	60	66	-20	18.2N 120.4E	65	103	-20	18.4N 116.1E	70	367	0
221200Z	16.9N 125.4E	60	17.2N 125.4E	55	18	-5	18.7N 121.9E	65	29	-15	19.4N 118.6E	70	86	-15	19.6N 115.0E	70	394	5
221800Z	17.2N 124.6E	65	17.3N 124.5E	60	8	-5	18.3N 121.0E	70	50	-10	18.8N 117.3E	75	205	-5	19.5N 113.6E	80	491	20
230000Z	17.5N 123.8E	70	17.5N 123.8E	65	0	-5	18.5N 120.8E	70	66	-15	19.2N 117.6E	75	231	-5	19.6N 113.9E	80	512	30
230600Z	18.0N 123.1E	80	18.3N 123.2E	75	19	-5	19.7N 119.8E	85	21	0	19.9N 116.0E	90	305	20	--.- ---.-	--	--	--
231200Z	18.6N 122.4E	80	18.7N 122.2E	80	13	0	19.8N 118.3E	90	86	5	20.2N 114.7E	95	382	30	--.- ---.-	--	--	--
231800Z	19.0N 121.5E	80	19.2N 121.2E	80	21	0	20.0N 117.3E	90	160	10	20.2N 113.8E	95	454	35	--.- ---.-	--	--	--
240000Z	19.6N 120.7E	85	19.7N 120.5E	80	13	-5	21.5N 117.6E	90	150	10	23.2N 115.2E	80	306	30	--.- ---.-	--	--	--
240600Z	19.9N 120.1E	85	20.1N 119.8E	80	21	-5	21.8N 117.0E	85	195	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241200Z	20.4N 119.7E	85	20.7N 119.6E	85	19	0	22.7N 117.2E	85	182	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
241800Z	21.3N 119.8E	80	21.4N 119.8E	85	6	5	20.5N 120.5E	85	282	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250000Z	22.2N 120.2E	80	22.3N 120.3E	85	8	5	26.2N 119.8E	70	8	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
250600Z	23.2N 120.2E	70	23.5N 120.2E	80	18	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	24.2N 120.1E	65	24.2N 120.1E	65	0	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	25.2N 120.0E	60	25.4N 120.0E	45	12	-15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	26.3N 119.7E	50	27.5N 119.4E	30	73	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS WARNING	24-HR	48-HR	72-HR	ALL FORECASTS WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	17NM	97NM	200NM	255NM	16NM	97NM	200NM	255NM
AVERAGE RIGHT ANGLE ERROR	9NM	58NM	134NM	157NM	9NM	58NM	134NM	157NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	11KTS	19KTS	13KTS	5KTS	11KTS	19KTS	13KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	1KTS	-1KTS	-1KTS	-2KTS	1KTS	-1KTS	-1KTS
NUMBER OF FORECASTS	20	17	13	9	21	17	13	9

TYPHOON VERA

0000Z 28 JUL TO 0600Z 01 AUG

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
280000Z	25.5N 130.2E	35	25.4N 130.3E	30	8	-5	25.7N 128.6E	45	55	-5	26.6N 126.2E	55	206	-40	28.5N 123.9E	65	239	-45
280600Z	25.4N 129.8E	40	25.4N 129.9E	40	5	0	25.8N 128.1E	50	84	-10	26.9N 125.7E	60	216	-40	28.5N 123.8E	70	219	-35
281200Z	25.3N 129.4E	40	25.2N 129.3E	45	8	5	25.6N 127.5E	55	115	-10	26.6N 125.2E	65	186	-35	27.8N 122.9E	75	191	-25
281800Z	25.2N 128.8E	45	25.2N 128.8E	45	0	0	25.7N 126.5E	50	140	-40	26.4N 124.0E	60	145	-45	27.3N 121.5E	70	165	-20
290000Z	24.9N 128.1E	50	24.8N 128.2E	55	8	5	24.8N 125.6E	65	96	-30	25.3N 123.0E	70	58	-40	26.2N 120.7E	75	116	-5
290600Z	24.6N 127.3E	60	24.8N 127.6E	65	20	5	25.2N 124.9E	75	116	-25	26.1N 121.8E	80	79	-25	27.3N 119.1E	45	150	-20
291200Z	23.9N 126.5E	65	24.2N 126.4E	80	19	15	23.6N 122.2E	90	148	-10	24.7N 119.1E	65	125	-35	--.- ---.-	--	--	--
291800Z	23.4N 126.0E	90	23.3N 125.5E	95	28	5	22.2N 121.0E	110	188	5	22.1N 118.1E	95	198	5	--.- ---.-	--	--	--
300000Z	23.2N 125.6E	95	23.0N 125.6E	95	12	0	21.8N 123.0E	100	162	-10	21.2N 120.8E	90	240	10	--.- ---.-	--	--	--
300600Z	23.3N 125.3E	100	23.3N 125.5E	100	11	0	22.9N 124.0E	115	174	10	21.8N 121.9E	115	287	50	--.- ---.-	--	--	--
301200Z	23.5N 124.9E	100	23.6N 125.0E	100	8	0	23.4N 122.7E	90	114	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
301800Z	24.0N 124.4E	105	24.0N 124.2E	100	11	-5	25.2N 121.4E	90	69	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310000Z	24.5N 123.6E	110	24.3N 123.8E	110	16	0	25.5N 121.2E	100	119	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310600Z	25.0N 122.6E	105	25.0N 122.8E	110	11	5	26.9N 118.2E	60	114	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311200Z	24.9N 121.4E	100	25.3N 121.3E	105	24	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	24.8N 120.2E	90	25.3N 119.8E	95	37	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	24.9N 119.1E	80	24.9N 119.2E	90	5	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	25.0N 118.0E	65	24.9N 118.3E	65	17	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	14NM	121NM	174NM	180NM	14NM	121NM	174NM	180NM
AVERAGE RIGHT ANGLE ERROR	8NM	72NM	123NM	162NM	8NM	72NM	123NM	162NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	14KTS	33KTS	25KTS	4KTS	14KTS	33KTS	25KTS
AVERAGE BIAS OF WIND ERROR	3KTS	-9KTS	-20KTS	-25KTS	3KTS	-9KTS	-20KTS	-25KTS
NUMBER OF FORECASTS	18	14	10	6	18	14	10	6

TYPHOON BABE

0000Z 02 SEP TO 1800Z 10 SEP

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
020000Z	8.3N 144.6E	30	8.0N 144.5E	30	19	0	10.3N 139.3E	40	46	0	13.1N 134.0E	45	143	-15	16.5N 128.7E	50	366	-10
020600Z	8.5N 143.0E	35	8.7N 143.0E	40	12	5	11.1N 137.7E	50	48	5	14.0N 132.6E	60	195	0	17.0N 127.7E	70	411	10
021200Z	8.9N 141.5E	35	9.2N 141.8E	40	25	5	12.0N 136.7E	50	88	0	14.3N 132.2E	60	209	0	17.3N 127.7E	70	400	10
021800Z	9.4N 140.1E	40	9.5N 140.5E	40	24	0	11.9N 135.7E	50	83	-5	14.3N 131.0E	60	210	0	16.6N 126.1E	70	351	10
030000Z	9.8N 138.7E	40	10.0N 139.0E	40	21	0	11.8N 133.6E	50	72	-10	13.7N 128.6E	60	234	0	15.5N 124.3E	70	363	5
030600Z	10.4N 137.3E	45	10.3N 137.5E	45	13	0	12.3N 132.2E	55	110	-5	14.4N 127.2E	65	305	5	16.1N 122.9E	75	408	5
031200Z	10.7N 136.0E	50	10.8N 136.3E	45	19	-5	12.8N 131.4E	55	133	-5	15.0N 126.5E	65	321	5	18.3N 121.8E	75	457	0
031800Z	10.7N 135.0E	55	11.3N 135.2E	45	38	-10	13.4N 130.4E	55	173	-5	16.1N 125.4E	65	358	5	18.9N 120.5E	75	506	-5
040000Z	10.7N 134.1E	60	11.7N 134.4E	50	62	-10	13.5N 130.3E	60	165	0	15.5N 126.3E	70	259	5	17.7N 122.6E	80	348	-5
040600Z	10.8N 133.3E	60	10.7N 134.0E	60	42	0	10.9N 131.1E	80	6	20	12.0N 127.5E	100	183	30	14.3N 123.3E	110	352	15
041200Z	10.8N 132.4E	60	10.8N 132.6E	60	12	0	10.9N 128.9E	80	83	20	11.5N 125.7E	90	296	15	12.9N 122.4E	85	456	-30
041800Z	10.9N 131.9E	60	10.8N 131.8E	60	8	0	11.0N 128.2E	80	124	20	11.5N 125.4E	90	329	10	13.1N 122.1E	85	492	-30
050000Z	11.0N 131.5E	60	10.9N 131.6E	60	8	0	11.2N 128.3E	70	159	5	11.9N 125.0E	65	354	-20	13.3N 121.2E	55	553	-75
050600Z	10.9N 131.0E	60	10.9N 130.7E	60	18	0	11.3N 127.5E	70	215	0	12.1N 124.2E	55	410	-40	13.6N 120.3E	50	595	-80
051200Z	11.1N 130.3E	60	11.0N 130.3E	60	6	0	11.3N 127.6E	70	249	-5	12.3N 124.1E	60	427	-55	13.5N 120.7E	50	610	-80
051800Z	12.1N 130.0E	60	11.1N 129.9E	60	60	0	11.6N 127.3E	70	271	-10	12.4N 124.2E	60	464	-55	13.7N 120.8E	50	650	-75
060000Z	13.2N 130.1E	65	13.2N 130.1E	70	0	5	16.2N 128.7E	80	30	-5	18.7N 125.2E	85	160	-45	20.3N 121.0E	90	435	-30
060600Z	14.2N 129.7E	70	14.1N 129.8E	75	8	5	17.2N 127.3E	85	64	-10	19.2N 123.7E	90	218	-40	20.4N 119.8E	90	557	-25
061200Z	15.2N 129.1E	75	15.0N 129.3E	75	17	0	18.3N 126.7E	85	63	-30	20.6N 123.3E	90	210	-40	22.3N 119.5E	90	570	-20
061800Z	15.9N 128.8E	80	15.9N 128.8E	75	0	-5	19.0N 126.4E	75	69	-40	21.8N 123.6E	80	216	-45	23.9N 120.3E	65	515	-40
070000Z	16.7N 128.6E	85	16.4N 128.7E	80	19	-5	19.2N 126.4E	90	93	-40	21.9N 123.4E	100	273	-20	24.1N 120.0E	90	484	-15
070600Z	17.7N 128.3E	95	17.7N 128.2E	90	6	-5	21.2N 125.8E	100	57	-30	23.7N 123.4E	110	293	-5	26.2N 121.3E	85	319	-10
071200Z	18.5N 127.8E	115	18.5N 127.7E	100	6	-15	21.5N 125.0E	115	103	-15	23.6N 121.8E	110	422	0	26.8N 119.6E	80	326	-5
071800Z	19.5N 127.5E	115	19.4N 127.4E	105	8	-10	22.7N 125.2E	115	121	-10	25.3N 121.5E	110	412	5	--.- ---.-	--	--	--
080000Z	20.5N 127.3E	130	20.5N 127.1E	130	11	0	24.0N 125.4E	130	144	10	27.2N 124.8E	125	211	20	--.- ---.-	--	--	--
080600Z	21.4N 126.8E	130	21.3N 126.8E	130	6	0	24.8N 125.4E	125	174	10	28.0N 125.0E	120	178	25	--.- ---.-	--	--	--
081200Z	21.9N 126.8E	130	22.1N 126.6E	130	16	0	25.5N 125.2E	125	205	15	28.6N 125.2E	120	184	35	--.- ---.-	--	--	--
081800Z	22.6N 127.4E	125	22.5N 127.0E	130	23	5	25.5N 127.2E	120	224	15	28.7N 127.8E	115	330	45	--.- ---.-	--	--	--
090000Z	23.6N 128.0E	120	23.7N 128.0E	130	6	10	27.3N 129.9E	120	315	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090600Z	25.0N 128.6E	115	25.0N 128.4E	125	11	10	28.8N 129.6E	115	307	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091200Z	26.9N 128.7E	110	26.8N 128.9E	125	12	15	31.8N 130.5E	110	368	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091800Z	29.2N 127.9E	105	29.1N 127.9E	125	6	20	35.7N 122.2E	90	251	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	30.7N 125.3E	105	30.7N 126.0E	120	36	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100600Z	30.9N 124.2E	95	30.7N 124.1E	110	13	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101200Z	31.2N 123.3E	85	31.2N 123.0E	100	15	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
101800Z	31.5N 122.3E	70	31.5N 122.0E	85	15	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	17NM	144NM	279NM	458NM	17NM	144NM	279NM	458NM
AVERAGE RIGHT ANGLE ERROR	11NM	95NM	192NM	324NM	11NM	95NM	192NM	324NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	13KTS	21KTS	26KTS	6KTS	13KTS	21KTS	26KTS
AVERAGE BIAS OF WIND ERROR	2KTS	-1KTS	-6KTS	-21KTS	2KTS	-1KTS	-6KTS	-21KTS
NUMBER OF FORECASTS	35	32	28	23	36	32	28	23

TYPHOON DINAH

1200Z 14 SEP TO 1800Z 23 SEP

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
141200Z	21.4N 127.8E	50	21.5N 127.9E	30	8	-20	22.3N 122.4E	45	245	-15	23.3N 119.1E	35	376	-15	24.4N 116.4E	30	450	-20
141800Z	20.5N 126.2E	55	20.7N 126.7E	30	30	-25	20.3N 121.4E	45	150	-10	21.3N 118.2E	50	277	0	22.5N 115.3E	50	316	-5
150000Z	19.4N 124.6E	60	19.3N 124.4E	50	13	-10	19.4N 118.9E	60	140	20	21.1N 115.2E	60	263	10	23.0N 111.5E	35	433	-25
150600Z	18.7N 123.6E	65	18.8N 123.6E	60	6	-5	19.1N 119.4E	65	116	20	20.8N 115.6E	60	200	10	22.9N 111.9E	45	412	-15
151200Z	18.2N 122.6E	60	18.3N 122.6E	70	6	10	18.1N 118.2E	70	62	20	19.1N 114.1E	80	157	30	21.0N 110.2E	80	443	20
151800Z	17.8N 121.1E	55	17.8N 121.4E	65	17	10	18.0N 117.2E	70	73	20	19.3N 113.3E	80	208	25	21.3N 109.8E	75	473	10
160000Z	17.3N 120.0E	40	17.3N 120.0E	60	0	20	17.4N 114.6E	80	98	30	18.1N 109.7E	75	420	15	18.6N 104.8E	60	770	-5
160600Z	17.2N 119.0E	45	17.4N 119.3E	55	21	10	17.5N 114.1E	65	120	15	17.8N 109.0E	60	484	0	18.3N 104.6E	55	800	-10
161200Z	17.1N 117.9E	50	17.2N 118.2E	55	18	5	17.5N 113.8E	65	109	15	18.1N 109.4E	60	479	0	19.4N 105.4E	55	766	-10
161800Z	16.8N 117.0E	50	17.2N 117.0E	55	24	5	17.5N 112.8E	65	200	10	18.2N 108.7E	60	531	-5	19.7N 104.8E	45	804	-25
170000Z	16.8N 116.2E	50	16.8N 115.8E	60	23	10	16.7N 111.6E	65	323	5	17.0N 107.9E	60	615	-5	18.2N 104.3E	30	854	-45
170600Z	17.5N 116.2E	50	17.2N 116.4E	60	21	10	17.5N 113.3E	55	245	-5	18.4N 110.0E	50	496	-15	19.7N 106.9E	40	697	-35
171200Z	16.9N 115.6E	50	17.3N 115.8E	60	26	10	17.7N 112.9E	55	288	-5	18.4N 109.6E	50	536	-15	19.9N 106.3E	40	718	-30
171800Z	17.3N 116.3E	55	17.4N 115.2E	55	63	0	17.9N 112.4E	50	329	-15	18.5N 109.5E	45	547	-25	19.9N 106.4E	40	701	-25
180000Z	18.0N 117.1E	60	17.2N 117.3E	55	49	-5	19.1N 115.8E	60	150	-5	20.7N 114.1E	55	293	-20	22.6N 111.8E	40	399	-25
180600Z	18.4N 117.5E	60	18.5N 117.2E	55	18	-5	20.5N 116.4E	60	140	-5	22.7N 114.6E	50	301	-25	--.- ---.-	--	--	--
181200Z	19.0N 117.8E	60	19.0N 117.6E	60	11	0	21.2N 118.0E	60	111	-5	23.9N 117.6E	60	236	-10	26.2N 117.4E	45	388	-15
181800Z	19.4N 118.0E	65	19.5N 117.9E	60	8	-5	21.6N 118.2E	60	119	-10	24.4N 118.0E	50	256	-15	26.3N 117.8E	45	449	-10
190000Z	19.6N 118.4E	65	19.8N 118.3E	60	13	-5	21.6N 119.3E	60	90	-15	24.0N 119.5E	50	247	-15	26.5N 119.2E	45	521	-5
190600Z	19.6N 118.7E	65	19.9N 118.6E	60	19	-5	21.6N 119.6E	60	85	-15	24.1N 119.8E	50	280	-15	26.3N 118.8E	35	554	-15
191200Z	19.6N 119.0E	65	20.3N 118.9E	60	42	-5	22.1N 119.8E	70	120	0	24.2N 120.1E	65	310	5	26.0N 119.6E	60	619	15
191800Z	19.8N 119.1E	70	19.9N 119.0E	60	8	-10	21.2N 119.8E	70	78	5	23.2N 120.1E	65	329	10	25.0N 119.5E	60	631	15
200000Z	20.1N 119.3E	75	20.0N 119.1E	65	13	-10	21.3N 119.8E	70	110	5	23.2N 120.0E	65	374	15	25.0N 119.4E	60	693	20
200600Z	20.2N 119.3E	75	20.2N 119.4E	70	6	-5	21.4N 120.3E	70	169	5	23.3N 120.0E	65	439	15	24.7N 118.6E	60	721	25
201200Z	20.2N 119.1E	70	20.3N 119.4E	70	18	0	21.0N 120.1E	70	175	10	22.5N 120.2E	65	479	20	24.1N 120.0E	60	824	40
201800Z	20.2N 118.9E	65	20.2N 118.9E	70	0	5	20.6N 119.8E	70	216	15	22.1N 120.3E	65	534	20	23.9N 120.0E	60	892	35
210000Z	20.0N 118.4E	65	19.9N 118.8E	70	23	5	20.3N 119.9E	60	262	10	22.0N 121.1E	55	631	15	--.- ---.-	--	--	--
210600Z	19.8N 117.8E	65	20.1N 118.0E	65	21	0	21.6N 117.9E	60	286	10	23.5N 118.4E	55	657	20	--.- ---.-	--	--	--
211200Z	19.7N 117.3E	60	19.7N 117.3E	65	0	5	19.7N 114.8E	55	163	10	20.8N 113.0E	45	449	25	--.- ---.-	--	--	--
211800Z	18.9N 116.4E	55	19.6N 116.2E	65	43	10	19.8N 113.0E	55	209	10	20.7N 111.1E	45	468	20	--.- ---.-	--	--	--
220000Z	18.4N 115.7E	50	18.2N 115.6E	55	13	5	16.0N 113.4E	45	70	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
220600Z	17.8N 114.8E	50	17.7N 114.9E	55	8	5	16.1N 111.9E	45	88	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221200Z	17.1N 113.9E	45	17.2N 113.9E	60	6	15	15.7N 110.9E	50	123	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--
221800Z	16.3N 113.1E	45	16.5N 113.1E	60	12	15	15.3N 109.8E	50	138	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230000Z	15.5N 112.3E	40	15.7N 112.4E	50	13	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
230600Z	14.7N 111.4E	35	14.7N 110.8E	50	35	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231200Z	13.7N 110.4E	20	14.0N 110.1E	50	25	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
231800Z	13.1N 109.1E	25	13.5N 108.5E	35	42	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	18NM	161NM	391NM	592NM	19NM	159NM	396NM	613NM
AVERAGE RIGHT ANGLE ERROR	11NM	107NM	255NM	409NM	13NM	106NM	254NM	398NM
AVERAGE MAGNITUDE OF WIND ERROR	8KTS	11KTS	14KTS	18KTS	9KTS	12KTS	15KTS	20KTS
AVERAGE BIAS OF WIND ERROR	2KTS	5KTS	1KTS	-9KTS	3KTS	6KTS	3KTS	-6KTS
NUMBER OF FORECASTS	36	32	28	23	38	34	30	25

TYPHOON GILDA

0000Z 03 OCT TO 0600Z 10 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
030000Z	16.5N 155.8E	30	16.7N 155.7E	30	13	0	20.2N 152.2E	35	228	-5	22.7N 148.8E	40	260	-25	25.7N 146.0E	45	258	-15
030600Z	16.8N 156.4E	30	17.5N 155.5E	30	66	0	20.3N 153.9E	35	122	-5	22.4N 151.6E	40	73	-25	24.4N 149.1E	45	36	-15
031200Z	17.5N 156.6E	30	17.7N 155.8E	30	47	0	19.8N 155.0E	40	41	-5	21.7N 153.6E	45	144	-20	23.7N 152.2E	50	195	-10
031800Z	17.8N 156.2E	35	18.2N 156.1E	30	25	-5	20.2N 155.8E	40	118	-15	22.2N 155.0E	45	260	-20	24.3N 154.9E	50	367	-10
040000Z	18.0N 155.5E	40	18.0N 155.8E	30	17	-10	19.6N 155.9E	40	179	-25	21.6N 155.3E	45	321	-15	23.5N 154.9E	50	422	-10
040600Z	18.6N 155.1E	40	18.1N 155.5E	40	37	0	19.0N 155.2E	50	232	-15	20.5N 154.6E	55	358	-5	22.3N 153.9E	60	466	-5
041200Z	19.3N 154.5E	45	18.2N 155.4E	40	83	-5	19.2N 155.1E	50	277	-15	20.7N 154.5E	55	389	-5	22.6N 153.8E	60	497	-5
041800Z	20.0N 153.7E	55	20.1N 153.6E	45	8	-10	22.4N 151.1E	50	44	-15	24.9N 148.9E	55	42	-5	27.7N 147.8E	60	122	-5
050000Z	20.6N 152.9E	65	20.8N 152.4E	45	30	-20	23.9N 148.8E	50	73	-10	27.5N 147.2E	55	82	-5	31.0N 147.6E	55	8	-15
050600Z	21.2N 151.8E	65	21.3N 151.4E	65	23	0	24.5N 148.0E	75	53	15	27.8N 148.5E	65	63	0	31.1N 151.3E	55	173	-10
051200Z	21.8N 151.0E	65	22.2N 150.2E	65	50	0	25.2N 146.7E	75	119	15	28.9N 146.1E	65	67	0	33.2N 148.6E	55	37	-10
051800Z	22.4N 150.3E	65	22.5N 149.7E	65	34	0	26.1N 146.8E	60	93	0	30.0N 147.0E	55	24	-10	32.6N 150.8E	50	114	-10
060000Z	23.0N 149.7E	60	23.3N 150.0E	65	24	5	26.7N 149.5E	60	101	0	30.7N 151.8E	50	221	-20	33.9N 157.0E	40	295	-15
060600Z	23.8N 149.2E	60	24.0N 150.0E	55	45	-5	27.3N 151.0E	45	191	-20	31.0N 154.3E	35	320	-30	34.7N 159.6E	30	350	-20
061200Z	24.4N 148.7E	60	24.9N 149.1E	55	37	-5	28.4N 149.1E	45	95	-20	31.2N 152.3E	40	201	-25	33.8N 156.9E	35	303	-10
061800Z	25.2N 148.2E	60	25.0N 148.0E	55	16	-5	27.9N 146.9E	45	110	-20	30.7N 149.9E	40	229	-20	33.2N 154.8E	35	441	-5
070000Z	26.2N 147.7E	60	25.6N 148.1E	60	42	0	28.7N 147.5E	60	131	-10	32.8N 149.1E	45	220	-10	35.5N 153.2E	35	538	-5
070600Z	27.4N 147.4E	65	26.8N 147.3E	60	36	-5	30.5N 147.1E	55	121	-10	33.8N 149.7E	45	266	-5	36.0N 154.2E	35	674	5
071200Z	28.5N 147.3E	65	28.7N 147.2E	60	13	-5	34.2N 148.7E	55	56	-10	39.7N 154.5E	45	70	0	--.- ---.-	--	--	--
071800Z	29.7N 147.3E	65	29.6N 146.8E	65	27	0	35.0N 148.0E	60	126	0	40.3N 154.3E	45	188	5	--.- ---.-	--	--	--
080000Z	30.9N 147.5E	70	30.8N 147.6E	65	8	-5	36.2N 150.2E	45	65	-10	41.0N 157.6E	35	217	-5	--.- ---.-	--	--	--
080600Z	32.3N 148.2E	65	31.9N 147.7E	65	35	0	36.8N 151.0E	45	104	-5	41.3N 158.9E	35	354	5	--.- ---.-	--	--	--
081200Z	33.4N 149.3E	65	33.5N 148.9E	65	21	0	39.3N 154.5E	45	52	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
081800Z	34.5N 150.5E	60	34.8N 150.9E	60	27	0	38.5N 159.9E	40	113	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090000Z	35.9N 151.5E	55	35.4N 151.9E	60	36	5	38.6N 158.5E	45	226	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
090600Z	37.3N 153.1E	50	36.3N 153.3E	55	60	5	39.5N 160.3E	45	320	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091200Z	38.7N 155.3E	45	38.7N 155.3E	50	0	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
091800Z	40.0N 158.4E	40	40.2N 157.0E	45	65	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100000Z	40.9N 162.4E	40	41.3N 160.2E	40	102	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
100600Z	41.6N 166.8E	30	42.8N 164.3E	40	132	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	35NM	123NM	191NM	272NM	39NM	130NM	198NM	294NM
AVERAGE RIGHT ANGLE ERROR	19NM	58NM	87NM	142NM	22NM	58NM	86NM	139NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	10KTS	12KTS	10KTS	4KTS	10KTS	12KTS	10KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	-7KTS	-12KTS	-10KTS	-2KTS	-6KTS	-11KTS	-9KTS
NUMBER OF FORECASTS	26	25	21	17	30	26	22	18

TYPHOON IVY

0600Z 21 OCT TO 0000Z 27 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
210600Z	16.6N 147.6E	30	16.8N 147.3E	25	21	-5	19.6N 147.2E	45	182	5	22.8N 147.3E	50	263	-5	25.8N 149.2E	50	262	-25
211200Z	17.1N 147.3E	30	17.3N 147.7E	30	26	0	20.2N 148.2E	45	249	5	23.3N 148.3E	55	239	-5	26.3N 150.2E	55	220	-20
211800Z	17.5N 146.7E	35	17.2N 147.3E	30	39	-5	19.3N 147.2E	45	138	0	21.7N 147.4E	55	118	-10	24.6N 148.8E	55	256	-30
220000Z	17.5N 145.9E	35	18.0N 147.0E	30	69	-5	20.2N 147.0E	45	138	-5	23.3N 147.6E	55	187	-15	27.0N 149.1E	55	297	-35
220600Z	17.3N 145.1E	40	17.3N 145.3E	35	11	-5	18.7N 143.7E	45	216	-10	20.3N 142.6E	55	511	-20	22.3N 142.2E	55	736	-35
221200Z	17.0N 145.4E	40	17.5N 144.6E	40	55	0	17.9N 143.2E	50	295	-10	19.6N 142.0E	55	617	-20	22.3N 141.7E	55	805	-35
221800Z	17.2N 146.2E	45	17.3N 146.1E	45	8	0	18.3N 145.2E	55	248	-10	19.8N 143.9E	60	595	-25	22.6N 143.6E	60	740	-25
230000Z	17.9N 146.7E	50	17.8N 146.7E	50	6	0	19.7N 145.4E	55	233	-15	22.2N 146.4E	60	470	-30	25.0N 146.8E	65	554	-20
230600Z	18.4N 147.5E	55	17.8N 147.1E	55	42	0	19.8N 147.6E	65	249	-10	22.2N 147.5E	70	476	-20	25.0N 147.9E	75	582	5
231200Z	19.3N 148.2E	60	18.8N 147.9E	60	34	0	23.1N 149.2E	75	176	0	28.4N 151.9E	75	201	-15	34.2N 158.3E	60	114	5
231800Z	20.4N 149.0E	65	20.2N 148.4E	60	36	-5	25.1N 150.0E	75	196	-10	30.9N 154.1E	75	192	-10	35.8N 161.7E	60	91	15
240000Z	21.3N 150.2E	70	21.8N 150.3E	65	30	-5	27.3N 153.8E	75	122	-15	32.4N 159.0E	75	256	-10	36.1N 167.4E	60	240	25
240600Z	22.0N 151.6E	75	21.6N 151.8E	70	26	-5	25.1N 156.7E	75	116	-15	30.6N 161.4E	70	218	0	--.- ---.-	--	--	--
241200Z	23.2N 152.4E	75	23.2N 152.5E	70	5	-5	29.0N 155.5E	70	102	-20	34.3N 162.1E	65	212	10	--.- ---.-	--	--	--
241800Z	24.3N 153.5E	85	25.0N 154.4E	80	64	-5	32.2N 159.2E	95	298	10	37.0N 169.0E	85	441	40	--.- ---.-	--	--	--
250000Z	25.3N 154.3E	90	25.4N 154.5E	80	12	-10	29.4N 156.2E	85	36	0	34.2N 158.8E	75	285	40	--.- ---.-	--	--	--
250600Z	26.3N 155.0E	90	26.4N 154.4E	90	33	0	30.7N 155.6E	85	88	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251200Z	27.3N 155.5E	90	27.2N 155.2E	90	17	0	30.8N 156.6E	80	128	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--
251800Z	28.1N 155.9E	85	27.8N 156.4E	90	32	5	31.2N 159.7E	80	217	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260000Z	28.8N 156.3E	85	29.4N 156.3E	85	36	0	33.7N 159.4E	70	290	35	--.- ---.-	--	--	--	--.- ---.-	--	--	--
260600Z	30.2N 157.2E	70	30.0N 157.0E	85	16	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261200Z	32.3N 158.6E	55	31.3N 158.3E	75	62	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
261800Z	34.8N 160.3E	45	32.6N 159.4E	70	139	25	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
270000Z	37.7N 162.8E	35	39.3N 164.9E	50	137	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	41NM	186NM	330NM	408NM	40NM	186NM	330NM	408NM
AVERAGE RIGHT ANGLE ERROR	23NM	77NM	167NM	241NM	22NM	77NM	167NM	241NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	13KTS	17KTS	23KTS	6KTS	13KTS	17KTS	23KTS
AVERAGE BIAS OF WIND ERROR	1KTS	1KTS	-6KTS	-15KTS	1KTS	1KTS	-6KTS	-15KTS
NUMBER OF FORECASTS	22	20	16	12	24	20	16	12

TYPHOON JEAN

1200Z 28 OCT TO 1200 03 NOV

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
281200Z	19.4N 156.9E	30	19.3N 156.9E	30	6	0	23.2N 153.1E	45	221	-15	27.9N 158.2E	40	210	-15	30.9N 171.3E	30	1007	-5
281800Z	19.8N 156.5E	35	20.4N 155.9E	30	49	-5	25.0N 152.6E	45	297	-20	28.6N 161.2E	40	324	-10	--.- ---.-	--	--	--
290000Z	20.4N 156.2E	40	20.3N 156.4E	35	13	-5	23.2N 156.1E	45	68	-20	27.5N 160.8E	40	312	-5	--.- ---.-	--	--	--
290600Z	20.8N 156.2E	50	20.9N 156.0E	55	13	5	24.0N 156.4E	60	92	0	28.0N 161.3E	50	398	10	--.- ---.-	--	--	--
291200Z	21.4N 156.6E	60	20.9N 156.1E	60	41	0	22.3N 155.3E	80	220	25	25.8N 157.0E	70	200	35	--.- ---.-	--	--	--
291800Z	22.1N 157.0E	65	21.9N 157.2E	65	16	0	24.6N 158.6E	80	62	30	28.0N 162.0E	65	579	35	--.- ---.-	--	--	--
300000Z	22.9N 157.3E	65	23.0N 157.8E	65	28	0	26.7N 160.3E	50	262	5	28.3N 166.9E	45	942	15	--.- ---.-	--	--	--
300600Z	23.5N 158.0E	60	23.6N 157.6E	65	23	5	27.0N 159.0E	55	263	15	29.2N 165.4E	45	950	15	--.- ---.-	--	--	--
301200Z	24.4N 158.6E	55	24.7N 158.6E	60	18	5	27.7N 162.0E	45	488	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
301800Z	24.3N 157.5E	50	23.6N 157.9E	55	47	5	25.2N 160.9E	35	508	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310000Z	24.2N 156.3E	45	24.0N 156.3E	30	12	-15	23.0N 152.5E	25	237	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310600Z	24.6N 154.9E	40	24.2N 155.2E	30	29	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311200Z	25.0N 153.4E	35	25.0N 153.5E	30	5	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
311800Z	25.5N 151.5E	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	25.8N 149.4E	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	26.0N 147.8E	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011200Z	26.2N 146.8E	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011800Z	26.3N 146.3E	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020000Z	26.5N 146.0E	30	26.6N 146.1E	30	8	0	29.3N 146.3E	40	133	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	26.9N 146.2E	30	27.2N 145.8E	30	28	0	30.1N 147.2E	35	226	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	27.1N 146.4E	30	27.0N 147.0E	30	32	0	27.7N 150.0E	30	261	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	27.4N 146.4E	30	27.0N 146.8E	30	32	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	27.1N 146.7E	30	27.7N 146.1E	30	48	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030600Z	26.4N 146.3E	25	27.2N 146.6E	30	50	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	25.8N 145.6E	25	26.0N 146.0E	25	25	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	24NM	219NM	289NM	1007NM	26NM	239NM	489NM	1007NM
AVERAGE RIGHT ANGLE ERROR	16NM	141NM	212NM	775NM	14NM	146NM	288NM	775NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	16KTS	15KTS	5KTS	3KTS	13KTS	18KTS	5KTS
AVERAGE BIAS OF WIND ERROR	-2KTS	3KTS	3KTS	-5KTS	-1KTS	4KTS	10KTS	-5KTS
NUMBER OF FORECASTS	12	9	5	1	20	14	8	1

TYPHOON KIM

0600Z 06 NOV TO 0000Z 17 NOV

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
060600Z	10.8N 153.2E	25	11.0N 152.9E	25	21	0	13.0N 149.7E	35	25	-5	14.2N 145.4E	45	67	-10	15.1N 140.6E	55	66	-50
061200Z	11.2N 152.4E	30	11.6N 152.7E	30	30	0	13.6N 150.0E	40	80	0	14.3N 145.9E	50	86	-15	14.3N 141.4E	60	181	-50
061800Z	11.6N 151.5E	35	11.8N 151.5E	35	12	0	13.3N 148.8E	45	39	0	14.3N 144.9E	55	114	-25	14.3N 140.3E	65	201	-50
070000Z	12.1N 150.7E	40	11.9N 151.1E	40	26	0	12.9N 148.6E	50	83	0	14.2N 144.5E	60	186	-35	14.5N 139.5E	70	234	-50
070600Z	12.6N 149.8E	40	12.5N 150.0E	40	13	0	13.8N 146.6E	50	50	-5	14.5N 142.7E	60	168	-45	14.8N 137.8E	70	202	-50
071200Z	12.8N 148.9E	40	12.9N 149.1E	40	13	0	14.2N 145.8E	50	78	-15	14.6N 141.5E	60	185	-50	14.8N 136.6E	70	202	-55
071800Z	13.0N 148.2E	45	13.1N 148.6E	40	24	-5	14.2N 145.3E	50	135	-30	14.6N 141.1E	60	244	-55	14.8N 136.2E	70	231	-55
080000Z	13.2N 147.4E	50	13.3N 147.2E	55	13	5	14.0N 143.2E	70	110	-25	14.5N 138.2E	75	160	-45	15.3N 133.2E	85	103	-35
080600Z	13.3N 146.1E	55	13.3N 146.0E	60	6	5	14.4N 141.1E	70	75	-35	15.1N 135.9E	75	92	-45	15.6N 130.8E	85	54	-30
081200Z	13.6N 144.6E	65	13.6N 144.6E	65	0	0	14.5N 139.2E	75	53	-35	15.5N 133.7E	80	50	-45	16.8N 128.0E	90	174	-20
081800Z	13.8N 143.0E	80	13.9N 143.2E	70	13	-10	15.0N 137.7E	80	46	-35	16.4N 132.3E	85	96	-40	18.1N 127.2E	95	245	-15
090000Z	14.0N 141.3E	95	14.0N 141.5E	80	12	-15	15.3N 134.9E	95	37	-25	18.2N 129.5E	105	233	-15	23.4N 129.5E	110	527	0
090600Z	14.3N 139.8E	105	14.2N 140.2E	95	24	-10	15.7N 134.0E	110	45	-10	18.8N 129.1E	115	263	0	24.4N 130.3E	115	597	10
091200Z	14.7N 138.3E	110	14.6N 138.5E	100	13	-10	16.7N 132.4E	110	115	-15	20.4N 128.8E	115	348	5	24.4N 130.5E	115	612	10
091800Z	15.0N 136.9E	115	15.0N 137.0E	105	6	-10	17.2N 131.2E	115	154	-10	20.8N 128.8E	115	367	5	25.0N 131.0E	115	673	5
100000Z	15.1N 135.5E	120	15.3N 135.6E	110	13	-10	17.9N 130.2E	120	200	0	21.9N 128.9E	120	436	10	25.5N 131.5E	110	733	0
100600Z	15.0N 134.3E	120	14.8N 134.1E	115	17	-5	14.6N 128.0E	125	162	10	15.3N 123.1E	125	297	20	16.8N 119.4E	100	303	-15
101200Z	14.9N 133.1E	125	14.8N 132.9E	120	13	-5	14.7N 127.9E	130	127	20	15.4N 122.9E	130	258	25	17.0N 119.1E	105	268	-10
101800Z	14.8N 132.2E	125	14.7N 132.2E	120	6	-5	14.8N 127.4E	130	127	20	15.4N 122.9E	130	208	20	17.0N 119.0E	105	226	0
110000Z	14.8N 131.5E	120	14.7N 131.3E	120	13	0	14.8N 127.4E	130	87	20	15.3N 123.1E	130	132	20	16.8N 119.3E	95	130	5
110600Z	14.7N 130.8E	115	14.7N 130.7E	120	6	5	14.8N 127.3E	130	53	25	15.4N 123.1E	130	76	15	16.9N 119.3E	95	96	30
111200Z	14.7N 130.1E	110	14.7N 130.1E	120	0	10	14.8N 126.7E	125	37	20	15.5N 122.3E	125	66	10	17.2N 118.8E	90	85	50
111800Z	14.7N 129.6E	110	14.7N 129.6E	110	0	0	14.8N 126.4E	100	12	-10	15.5N 122.4E	100	43	-5	17.0N 119.0E	70	66	35
120000Z	14.6N 128.9E	110	14.7N 129.1E	105	13	-5	14.8N 126.4E	95	64	-15	15.3N 123.1E	95	139	5	15.6N 119.3E	70	91	35
120600Z	14.6N 128.2E	105	14.6N 128.1E	105	6	0	14.4N 124.6E	95	29	-20	14.2N 120.4E	70	84	5	13.4N 116.8E	70	235	35
121200Z	14.6N 127.3E	105	14.6N 127.4E	105	6	0	14.5N 124.0E	95	53	-20	14.5N 119.8E	70	108	30	14.4N 116.6E	70	217	30
121800Z	14.6N 126.4E	110	14.6N 126.2E	105	12	-5	14.6N 122.6E	95	26	-10	14.9N 118.6E	70	81	35	15.1N 115.0E	65	302	25
130000Z	14.7N 125.3E	110	14.4N 125.5E	110	21	0	14.4N 122.2E	90	96	0	14.8N 118.6E	70	111	35	15.1N 115.3E	65	371	25
130600Z	14.7N 124.2E	115	14.6N 124.2E	110	6	-5	14.8N 120.3E	70	55	5	15.0N 117.0E	70	143	35	15.1N 113.8E	65	518	30
131200Z	14.7N 123.1E	115	14.6N 123.1E	120	6	5	14.7N 119.4E	85	84	45	14.8N 115.7E	75	228	35	14.8N 112.4E	70	672	40
131800Z	14.8N 122.2E	105	14.7N 122.1E	115	8	10	14.8N 118.5E	80	85	45	14.8N 115.1E	75	310	35	14.8N 111.8E	70	789	40
140000Z	15.1N 120.7E	90	15.2N 120.7E	95	6	5	15.7N 117.2E	80	75	45	15.7N 114.0E	75	405	35	15.7N 110.8E	70	902	40
140600Z	15.3N 119.5E	65	15.6N 119.6E	90	19	25	15.7N 115.7E	80	166	45	15.7N 112.3E	75	570	40	--.-	---.-	--	--	--
141200Z	15.8N 118.5E	40	15.5N 118.1E	65	29	25	15.4N 114.1E	50	279	10	15.3N 110.9E	40	731	10	--.- ---.-	--	--	--
141800Z	16.2N 118.2E	35	15.9N 117.7E	55	34	20	16.1N 114.1E	50	311	10	16.1N 110.8E	40	803	10	--.- ---.-	--	--	--
150000Z	16.6N 118.1E	35	16.4N 118.0E	45	13	10	17.5N 116.8E	40	212	0	16.4N 114.3E	35	704	5	--.- ---.-	--	--	--
150600Z	17.1N 118.2E	35	16.5N 118.0E	40	38	5	16.2N 116.6E	30	354	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151200Z	17.6N 118.4E	40	17.6N 118.1E	40	17	0	19.1N 117.8E	30	277	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
151800Z	18.4N 119.0E	40	18.7N 118.6E	35	29	-5	22.5N 121.3E	30	161	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160000Z	19.5N 119.9E	40	19.9N 119.3E	35	41	-5	23.6N 122.5E	30	193	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
160600Z	20.3N 121.1E	35	20.5N 121.2E	30	13	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161200Z	20.8N 122.4E	30	21.0N 122.0E	30	25	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
161800Z	21.3N 123.9E	30	21.4N 123.2E	30	39	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
170000Z	21.8N 125.4E	30	21.5N 125.6E	25	21	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	14NM	103NM	193NM	274NM	16NM	111NM	239NM	322NM
AVERAGE RIGHT ANGLE ERROR	9NM	52NM	108NM	165NM	10NM	57NM	129NM	186NM
AVERAGE MAGNITUDE OF WIND ERROR	6KTS	17KTS	26KTS	28KTS	6KTS	16KTS	24KTS	29KTS
AVERAGE BIAS OF WIND ERROR	0KTS	-0KTS	-0KTS	-6KTS	0KTS	-0KTS	0KTS	-1KTS
NUMBER OF FORECASTS	39	37	33	29	44	40	36	32

TYPHOON LUCY

0600Z 28 NOV TO 1800Z 07 DEC

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
280600Z	6.8N 160.0E	30	6.7N 160.4E	30	24	0	7.5N 155.7E	45	113	15	8.6N 151.0E	50	127	25	9.9N 146.5E	55	376	20
281200Z	6.8N 158.3E	30	6.8N 158.4E	30	6	0	7.7N 152.1E	35	48	10	8.7N 146.2E	40	97	15	9.7N 140.7E	45	130	10
281800Z	7.0N 156.6E	30	6.9N 156.8E	30	13	0	7.5N 150.7E	40	86	20	8.6N 144.9E	45	57	20	9.6N 139.5E	50	153	10
290000Z	7.4N 155.2E	30	7.0N 154.3E	30	58	0	7.8N 148.3E	40	163	20	9.2N 143.6E	45	86	15	10.7N 139.0E	50	192	5
290600Z	7.6N 153.8E	30	7.7N 153.5E	30	19	0	9.2N 147.2E	35	168	10	10.9N 141.5E	40	165	5	13.1N 136.1E	45	138	-10
291200Z	7.3N 152.8E	25	8.1N 152.0E	30	67	5	9.6N 145.7E	35	157	10	11.5N 139.9E	40	135	5	13.8N 134.7E	45	147	-20
291800Z	7.1N 152.1E	20	8.4N 150.5E	30	122	10	10.0N 144.4E	40	145	15	12.0N 138.7E	45	113	5	14.5N 133.5E	50	144	-25
300000Z	6.9N 150.9E	20	7.4N 151.4E	30	42	10	8.1N 147.6E	35	284	5	8.9N 142.8E	40	438	-5	9.9N 138.1E	45	434	-50
300600Z	7.3N 149.3E	25	7.0N 150.0E	30	45	5	7.2N 145.8E	35	333	0	8.1N 141.2E	40	441	-15	9.0N 136.6E	45	438	-65
301200Z	7.5N 147.3E	25	7.6N 147.7E	30	24	5	8.5N 143.4E	35	298	0	9.3N 139.3E	45	375	-20	10.5N 135.0E	50	350	-60
301800Z	7.7N 145.2E	25	7.6N 146.0E	30	48	5	8.4N 141.1E	35	271	-5	9.6N 137.0E	40	322	-35	11.2N 133.3E	50	296	-65
010000Z	8.0N 142.8E	30	7.7N 144.7E	30	114	0	8.8N 139.2E	35	253	-10	10.3N 134.0E	40	217	-55	11.7N 130.0E	50	167	-65
010600Z	8.4N 140.3E	35	8.2N 140.8E	40	32	5	9.5N 134.9E	60	116	5	11.4N 130.1E	70	103	-40	13.0N 126.4E	75	193	-35
011200Z	9.7N 138.5E	35	10.3N 138.7E	45	38	10	14.2N 133.4E	60	149	-5	16.7N 129.2E	70	200	-40	17.7N 124.9E	75	221	-30
011800Z	10.8N 137.2E	40	11.1N 136.6E	50	39	10	15.0N 131.0E	65	173	-10	17.4N 126.7E	70	246	-45	18.7N 122.8E	75	362	-25
020000Z	11.4N 135.8E	45	11.5N 135.6E	50	13	5	11.9N 128.8E	65	155	-30	12.9N 122.8E	65	351	-50	13.9N 116.6E	45	816	-55
020600Z	11.4N 134.5E	55	11.5N 134.0E	55	30	0	11.2N 127.4E	65	209	-45	13.6N 121.6E	60	418	-50	13.7N 115.5E	45	966	-45
021200Z	11.7N 133.4E	65	11.5N 132.9E	55	32	-10	11.7N 127.7E	65	159	-45	13.2N 122.8E	60	392	-45	13.7N 117.6E	45	970	-35
021800Z	12.4N 132.3E	75	11.5N 132.3E	60	54	-15	11.8N 128.3E	70	139	-45	12.4N 124.4E	70	417	-30	13.5N 120.7E	55	910	-15
030000Z	12.8N 131.3E	95	12.9N 131.4E	85	8	-10	13.7N 126.9E	110	109	-5	14.6N 122.4E	100	497	0	15.8N 119.0E	60	1027	-5
030600Z	13.1N 130.4E	110	13.1N 131.2E	105	47	-5	14.1N 126.2E	120	157	10	15.4N 122.0E	110	586	20	15.6N 118.3E	70	1181	10
031200Z	13.4N 129.8E	110	13.4N 129.9E	110	6	0	14.6N 126.7E	120	171	15	15.0N 123.2E	110	658	30	16.3N 120.6E	70	1162	15
031800Z	14.0N 129.1E	115	13.8N 129.1E	120	12	5	14.9N 125.8E	120	252	20	16.4N 123.4E	110	685	40	18.7N 123.7E	95	1075	40
040000Z	14.2N 128.7E	115	14.5N 128.7E	120	18	5	17.6N 127.2E	120	175	20	19.7N 126.9E	105	524	40	22.4N 129.8E	85	827	30
040600Z	15.5N 128.5E	110	15.2N 128.2E	110	25	0	17.7N 127.0E	100	271	10	20.0N 127.2E	90	617	30	22.8N 130.5E	80	910	30
041200Z	16.6N 128.6E	105	16.3N 128.7E	110	19	5	19.7N 130.4E	100	163	20	22.8N 134.2E	90	332	35	25.0N 140.0E	75	561	35
041800Z	17.7N 129.1E	100	18.0N 129.2E	105	19	5	22.0N 132.7E	90	72	20	24.8N 138.3E	70	265	15	27.8N 146.5E	60	521	20
050000Z	18.8N 129.9E	100	18.6N 129.5E	100	26	0	22.3N 133.2E	85	149	20	25.1N 139.4E	65	331	10	--.- ---.-	--	--	--
050600Z	20.2N 131.0E	90	19.8N 130.6E	100	33	10	23.7N 135.3E	80	170	20	25.8N 142.8E	60	306	10	--.- ---.-	--	--	--
051200Z	21.6N 132.5E	80	21.6N 132.1E	95	22	15	26.3N 138.7E	75	247	20	28.9N 149.6E	50	412	10	--.- ---.-	--	--	--
051800Z	22.0N 134.0E	70	22.4N 133.7E	90	29	20	26.3N 140.4E	60	249	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060000Z	22.2N 135.9E	65	22.9N 136.3E	65	47	0	26.0N 146.5E	35	223	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
060600Z	22.3N 138.0E	50	22.4N 137.9E	75	8	15	23.7N 147.1E	45	78	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061200Z	22.4N 140.2E	55	22.5N 140.2E	70	6	15	24.3N 149.9E	30	138	-10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
061800Z	22.6N 142.5E	55	22.8N 142.5E	60	12	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070000Z	22.6N 144.8E	55	22.8N 144.8E	50	12	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
070600Z	22.4N 147.0E	50	22.5N 146.8E	45	13	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071200Z	22.0N 149.7E	40	22.5N 149.7E	40	30	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
071800Z	21.3N 152.9E	40	22.2N 152.0E	35	73	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	26NM	188NM	367NM	543NM	33NM	178NM	330NM	543NM
AVERAGE RIGHT ANGLE ERROR	15NM	107NM	187NM	255NM	18NM	97NM	172NM	255NM
AVERAGE MAGNITUDE OF WIND ERROR	7KTS	16KTS	26KTS	31KTS	6KTS	15KTS	25KTS	31KTS
AVERAGE BIAS OF WIND ERROR	3KTS	-2KTS	-7KTS	-14KTS	3KTS	2KTS	-3KTS	-14KTS
NUMBER OF FORECASTS	27	26	26	27	39	34	30	27

TYPHOON MARY

0600Z 20 DEC TO 1800Z 03 JAN

	BEST TRACK		WARNING				24 HOUR FORECAST				48 HOUR FORECAST				72 HOUR FORECAST			
					ERRORS				ERRORS				ERRORS				ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
200600Z	9.7N 179.4E	30	10.1N 179.3E	30	25	0	11.6N 178.4E	40	96	0	13.0N 175.7E	25	174	-20	--.- ---.-	--	--	--
201200Z	10.2N 179.7E	30	10.0N 179.0E	30	43	0	10.9N 179.5E	40	73	0	12.3N 177.0E	25	178	-25	--.- ---.-	--	--	--
201800Z	10.4N 179.6E	35	9.5N 179.2E	30	59	-5	10.7N 179.5E	40	116	0	12.2N 177.0E	25	206	-35	--.- ---.-	--	--	--
210000Z	10.3N 179.4E	40	9.7N 179.0E	40	43	0	9.7N 179.0E	40	141	0	10.5N 179.0E	25	361	-45	--.- ---.-	--	--	--
210600Z	10.2N 179.2E	40	9.6N 178.8E	40	43	0	9.6N 178.6E	40	196	-5	9.6N 178.8E	25	411	-45	--.- ---.-	--	--	--
211200Z	9.9N 178.8E	40	10.0N 178.8E	40	6	0	10.0N 178.8E	30	255	-20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
211800Z	9.7N 177.8E	40	9.8N 177.5E	40	19	0	9.8N 175.0E	50	105	-10	9.8N 171.7E	40	157	-30	9.8N 168.6E	30	179	-60
220000Z	9.8N 176.6E	40	9.9N 176.6E	50	6	10	10.0N 173.6E	50	88	-20	10.0N 170.4E	40	152	-35	10.0N 167.2E	30	181	-60
220600Z	10.1N 175.5E	45	10.1N 175.2E	45	18	0	10.1N 171.1E	55	107	-15	10.1N 167.1E	50	206	-30	10.1N 163.1E	40	368	-45
221200Z	10.6N 174.5E	50	10.1N 174.3E	50	32	0	9.8N 170.5E	60	132	-10	9.6N 166.5E	55	269	-30	9.5N 162.5E	50	389	-45
221800Z	11.0N 173.7E	60	10.8N 173.4E	60	21	0	11.8N 170.8E	75	27	5	12.2N 167.5E	85	115	-5	12.4N 163.4E	90	295	25
230000Z	11.3N 172.9E	70	11.3N 173.0E	65	6	-5	13.4N 169.8E	85	54	10	15.7N 167.1E	85	237	-5	19.3N 170.3E	60	561	0
230600Z	11.6N 172.1E	70	11.8N 171.7E	70	26	0	14.1N 168.2E	90	101	10	17.0N 166.7E	85	335	0	20.6N 169.8E	55	672	-5
231200Z	11.9N 171.2E	70	12.4N 170.9E	70	35	0	15.0N 168.3E	85	130	0	18.4N 168.5E	80	412	-15	21.5N 171.8E	50	824	-5
231800Z	12.2N 170.6E	70	12.9N 170.0E	70	55	0	16.5N 167.9E	70	243	-20	20.5N 170.4E	50	587	-15	--.- ---.-	--	--	--
240000Z	12.5N 169.9E	75	12.7N 170.2E	70	21	-5	14.6N 168.3E	60	147	-30	17.7N 168.1E	50	439	-10	--.- ---.-	--	--	--
240600Z	12.8N 169.3E	80	13.0N 169.4E	70	13	-10	15.2N 167.6E	65	215	-20	18.3N 168.5E	55	519	-5	--.- ---.-	--	--	--
241200Z	13.1N 169.4E	85	13.2N 168.9E	70	30	-15	15.4N 167.3E	70	249	-25	18.3N 168.4E	55	569	0	--.- ---.-	--	--	--
241800Z	12.7N 169.4E	90	13.1N 169.1E	70	30	-20	15.2N 167.3E	70	262	5	18.1N 168.2E	55	616	5	--.- ---.-	--	--	--
250000Z	12.3N 169.2E	90	12.4N 169.0E	75	13	-15	13.6N 166.4E	80	197	20	16.2N 165.7E	70	511	20	19.5N 168.0E	60	1023	20
250600Z	11.9N 169.1E	85	11.6N 169.3E	95	21	10	10.7N 167.2E	95	76	35	10.0N 163.3E	90	241	45	10.0N 157.0E	90	306	50
251200Z	11.5N 168.8E	95	11.6N 168.8E	95	6	0	11.3N 165.7E	100	123	45	11.3N 161.0E	100	247	60	11.3N 156.8E	90	388	50
251800Z	10.9N 168.2E	65	11.0N 168.3E	90	8	25	10.5N 165.3E	100	153	50	10.4N 160.5E	100	297	60	10.4N 156.4E	90	425	45
260000Z	10.4N 167.2E	60	10.5N 167.4E	75	13	15	9.5N 163.7E	65	148	15	9.6N 159.8E	55	360	15	10.0N 155.7E	50	441	0
260600Z	9.9N 166.2E	60	9.9N 166.2E	65	0	5	9.6N 161.4E	55	127	10	9.6N 157.0E	45	307	5	9.9N 152.5E	45	339	-5
261200Z	9.4N 164.9E	55	9.7N 164.4E	65	34	10	9.6N 158.4E	55	64	15	9.7N 152.7E	45	163	5	9.9N 147.5E	45	138	-10
261800Z	9.0N 163.2E	50	9.3N 163.3E	60	19	10	9.1N 157.2E	50	95	10	9.1N 151.5E	45	184	0	9.6N 146.4E	45	153	-10
270000Z	8.8N 161.3E	50	8.9N 161.7E	60	24	10	8.8N 155.9E	50	135	10	9.2N 150.1E	45	164	-5	9.8N 144.9E	40	129	-15
270600Z	8.8N 159.4E	45	8.9N 159.6E	50	13	5	9.0N 153.2E	45	102	5	9.5N 147.6E	40	115	-10	9.8N 142.3E	40	56	-10
271200Z	9.0N 157.5E	40	9.0N 157.5E	50	0	10	9.5N 150.6E	40	87	0	10.0N 144.7E	35	81	-20	10.4N 139.5E	35	43	-10
271800Z	9.2N 155.6E	40	8.8N 155.4E	45	27	5	8.9N 148.0E	35	154	-10	9.2N 141.7E	30	170	-25	9.7N 136.0E	20	172	-20
280000Z	9.4N 153.7E	40	8.9N 153.2E	45	42	5	9.1N 146.3E	35	176	-15	10.2N 140.0E	30	165	-25	11.8N 134.5E	30	204	-10
280600Z	10.0N 151.8E	40	9.9N 152.0E	40	13	0	11.4N 146.1E	30	47	-20	12.4N 141.3E	30	126	-20	12.5N 136.4E	25	182	-15
281200Z	10.9N 150.2E	40	10.0N 149.9E	40	57	0	12.0N 143.2E	30	145	-25	13.4N 137.9E	30	234	-15	14.2N 132.7E	25	336	-10
281800Z	11.2N 149.2E	45	11.8N 148.7E	45	46	0	14.6N 142.2E	55	253	0	16.0N 136.3E	60	383	20	16.5N 130.9E	65	485	30
290000Z	11.3N 148.3E	50	11.3N 148.4E	50	6	0	12.1N 144.1E	60	127	5	12.7N 139.7E	70	215	30	11.8N 135.3E	70	246	35
290600Z	11.3N 146.9E	50	11.3N 147.1E	55	12	5	11.0N 144.5E	60	181	10	11.1N 137.6E	75	138	35	12.1N 134.0E	85	237	55
291200Z	11.1N 145.5E	55	11.2N 145.3E	55	13	0	11.7N 139.9E	45	91	0	11.0N 134.7E	40	126	5	10.8N 129.0E	35	42	5
291800Z	10.8N 144.1E	55	11.1N 144.1E	55	18	0	11.0N 139.3E	45	59	5	10.4N 134.5E	40	127	5	10.0N 129.3E	35	112	5
300000Z	10.4N 142.8E	55	10.4N 142.7E	55	6	0	9.8N 138.4E	45	59	5	10.1N 134.0E	40	130	5	10.5N 129.9E	35	237	5
300600Z	10.3N 141.5E	50	10.2N 141.8E	55	19	5	9.5N 137.4E	50	88	10	9.8N 132.9E	40	142	10	10.1N 128.8E	35	224	5
301200Z	10.2N 140.2E	45	10.1N 140.3E	55	8	10	9.7N 135.7E	45	81	10	9.9N 131.1E	40	130	10	10.3N 127.2E	35	182	5
301800Z	10.1N 138.9E	40	10.2N 139.0E	50	8	10	9.9N 133.9E	45	83	10	10.1N 130.0E	40	153	10	11.1N 126.4E	35	166	10
310000Z	9.9N 137.4E	40	10.2N 137.9E	50	34	10	10.2N 133.3E	40	95	5	10.4N 129.2E	30	195	0	10.8N 125.6E	20	134	0
310600Z	9.5N 135.9E	40	9.9N 136.1E	45	27	5	9.7N 130.4E	35	25	5	10.2N 125.5E	20	29	-10	--.- ---.-	--	--	--
311200Z	8.9N 134.6E	35	9.1N 134.5E	45	13	10	9.1N 128.8E	35	60	5	9.9N 124.5E	30	38	0	--.- ---.-	--	--	--
311800Z	8.7N 133.2E	35	8.1N 133.5E	35	40	0	7.9N 128.0E	25	125	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010000Z	9.4N 131.9E	35	8.1N 131.6E	35	80	0	8.1N 125.4E	25	117	-5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
010600Z	10.1N 130.5E	30	10.0N 130.5E	40	6	10	10.8N 125.3E	30	40	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
011200Z	10.1N 128.9E	30	10.0N 128.8E	45	8	15	11.3N 123.3E	45	71	15	12.2N 118.2E	40	446	20	--.- ---.-	--	--	--
011800Z	9.9N 127.4E	30	9.9N 127.2E	45	12	15	11.2N 121.6E	40	138	15	11.5N 117.0E	40	458	20	--.- ---.-	--	--	--
020000Z	10.0N 125.9E	30	9.9N 125.8E	45	8	15	11.2N 120.7E	35	220	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
020600Z	10.2N 125.0E	30	10.4N 125.6E	40	37	10	11.1N 122.2E	30	196	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021200Z	10.4N 124.1E	30	10.7N 124.2E	35	19	5	11.8N 119.6E	35	361	15	--.- ---.-	--	--	--	--.- ---.-	--	--	--
021800Z	10.0N 123.8E	25	10.9N 123.0E	35	71	10	11.9N 118.6E	40	406	20	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030000Z	9.3N 123.9E	20	11.0N 124.0E	30	102	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
030600Z	8.4N 124.1E	20	11.3N 123.4E	30	178	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031200Z	7.4N 124.0E	20	10.0N 124.0E	25	155	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
031800Z	6.3N 122.7E	20	10.0N 124.0E	20	234	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	TYPHOONS WHILE WIND OVER 35KTS				ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	24NM	129NM	267NM	341NM	34NM	135NM	256NM	299NM
AVERAGE RIGHT ANGLE ERROR	16NM	74NM	146NM	159NM	23NM	86NM	140NM	132NM
AVERAGE MAGNITUDE OF WIND ERROR	5KTS	13KTS	20KTS	24KTS	6KTS	12KTS	18KTS	21KTS
AVERAGE BIAS OF WIND ERROR	2KTS	1KTS	-4KTS	-3KTS	3KTS	3KTS	-2KTS	0KTS
NUMBER OF FORECASTS	46	44	39	25	59	55	47	33

6. INDIAN OCEAN AREA CYCLONE DATA

TROPICAL CYCLONE 17-77

2000Z 11 MAY TO 0800Z 13 MAY

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
112000Z	17.6N 88.9E	55	17.1N 89.5E	35	45	-20	19.7N 91.4E	50	137	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120800Z	20.2N 89.2E	60	20.1N 89.2E	65	6	5	24.1N 89.9E	35	117	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--
122000Z	21.8N 90.4E	40	21.7N 89.3E	70	61	30	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130800Z	24.8N 91.9E	25	25.0N 92.0E	35	13	10	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	31NM	127NM	0NM	0NM
AVERAGE RIGHT ANGLE ERROR	31NM	122NM	0NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	16KTS	10KTS	0KTS	0KTS
AVERAGE BIAS OF WIND ERROR	6KTS	10KTS	0KTS	0KTS
NUMBER OF FORECASTS	4	2	0	0

TROPICAL CYCLONE 18-77

2000Z 10 JUN TO 0800 13 JUN

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
102000Z	19.0N 66.8E	35	19.0N 66.8E	40	0	5	21.0N 64.5E	45	91	-10	23.4N 62.2E	50	214	-5	--.- ---.-	--	--	--
110800Z	19.7N 65.2E	50	20.4N 65.0E	55	43	5	23.1N 62.4E	65	182	5	25.7N 59.7E	65	326	25	--.- ---.-	--	--	--
112000Z	19.8N 63.5E	55	19.8N 64.0E	60	28	5	19.9N 60.7E	55	66	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
120800Z	20.2N 61.4E	60	20.1N 61.2E	60	13	0	20.4N 57.6E	45	28	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
122000Z	20.6N 59.8E	55	20.4N 59.8E	60	12	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
130800Z	20.4N 58.3E	40	20.9N 58.3E	45	30	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	21NM	92NM	270NM	0NM
AVERAGE RIGHT ANGLE ERROR	21NM	85NM	250NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	5KTS	15KTS	0KTS
AVERAGE BIAS OF WIND ERROR	4KTS	0KTS	10KTS	0KTS
NUMBER OF FORECASTS	6	4	2	0

TROPICAL CYCLONE 19-77

2000Z 29 OCT TO 2000Z 31 OCT

	BEST TRACK		WARNING		ERRORS		24 HOUR FORECAST		ERRORS		48 HOUR FORECAST		ERRORS		72 HOUR FORECAST		ERRORS	
	POSIT	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND	POSIT	WIND	DST	WIND
292000Z	13.0N 85.2E	35	13.2N 85.1E	35	13	0	13.8N 82.5E	45	56	10	14.5N 80.0E	55	122	25	--.- ---.-	--	--	--
300800Z	13.9N 83.4E	35	14.7N 84.3E	35	71	0	17.3N 82.5E	45	162	5	--.- ---.-	--	--	--	--.- ---.-	--	--	--
302000Z	14.7N 82.8E	35	15.0N 82.0E	40	50	5	16.5N 79.0E	30	12	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--
310800Z	15.6N 80.3E	40	15.2N 80.4E	40	25	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--
312000Z	16.3N 79.0E	30	15.8N 78.0E	30	65	0	--.- ---.-	--	--	--	--.- ---.-	--	--	--	--.- ---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	45NM	77NM	122NM	0NM
AVERAGE RIGHT ANGLE ERROR	44NM	73NM	68NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	1KTS	5KTS	25KTS	0KTS
AVERAGE BIAS OF WIND ERROR	1KTS	5KTS	25KTS	0KTS
NUMBER OF FORECASTS	5	3	1	0

TROPICAL CYCLONE 21-77

2000Z 10 NOV TO 2000Z 21 NOV

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
102000Z	11.4N	83.9E	40	11.4N	84.3E	35	23	-5	12.0N	80.7E	40	67	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
110800Z	11.3N	82.0E	40	11.3N	82.1E	45	6	5	11.2N	78.6E	40	33	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--
112000Z	11.0N	80.2E	45	11.0N	80.1E	55	6	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
120800Z	10.8N	78.4E	40	11.0N	78.2E	30	17	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
142000Z	13.6N	68.2E	45	12.7N	68.5E	35	57	-10	13.2N	64.5E	50	116	0	14.8N	61.2E	50	354	-15	--.-	---.-	--	--	--
150800Z	14.5N	66.6E	50	14.4N	66.4E	45	13	-5	15.5N	62.3E	50	292	-10	16.1N	58.5E	55	555	-15	--.-	---.-	--	--	--
152000Z	13.8N	66.4E	50	14.1N	66.4E	60	18	10	14.3N	64.2E	60	184	-5	14.7N	61.2E	50	400	-20	--.-	---.-	--	--	--
160800Z	13.3N	66.8E	60	14.2N	66.2E	60	64	0	14.3N	65.1E	60	175	-10	14.6N	62.3E	50	399	-20	--.-	---.-	--	--	--
162000Z	12.7N	66.9E	65	14.0N	67.2E	65	80	0	15.5N	66.2E	65	232	-5	16.8N	64.7E	60	456	-5	--.-	---.-	--	--	--
170800Z	12.2N	67.2E	70	13.0N	67.2E	70	48	0	13.9N	67.2E	65	171	15	14.9N	65.5E	95	401	40	--.-	---.-	--	--	--
172000Z	11.8N	67.4E	70	12.1N	66.8E	70	39	0	12.9N	66.2E	80	227	15	15.1N	65.3E	90	472	40	--.-	---.-	--	--	--
180800Z	11.2N	68.2E	70	11.6N	67.4E	65	53	-5	11.1N	68.0E	60	148	5	13.3N	66.7E	70	288	25	--.-	---.-	--	--	--
182000Z	10.6N	69.3E	65	10.5N	69.5E	60	13	-5	12.2N	71.1E	55	144	5	14.3N	69.4E	65	322	20	--.-	---.-	--	--	--
190800Z	10.1N	70.3E	55	10.1N	71.0E	50	41	-5	11.4N	73.0E	50	93	5	13.8N	73.0E	60	155	15	--.-	---.-	--	--	--
192000Z	9.8N	71.3E	50	9.9N	70.4E	50	53	0	11.2N	71.0E	50	138	5	13.4N	69.2E	60	275	25	--.-	---.-	--	--	--
200800Z	10.0N	72.3E	45	10.8N	71.7E	50	59	5	13.2N	72.4E	55	158	10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
202000Z	10.4N	73.2E	45	11.5N	73.7E	45	72	0	14.0N	75.9E	30	125	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--
210800Z	11.8N	74.7E	45	10.9N	74.1E	45	64	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
212000Z	14.5N	73.8E	35	15.3N	74.2E	40	53	5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	41NM	153NM	371NM	0NM
AVERAGE RIGHT ANGLE ERROR	29NM	108NM	250NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	7KTS	22KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-1KTS	1KTS	8KTS	0KTS
NUMBER OF FORECASTS	19	15	11	0

TROPICAL CYCLONE 22-77

0800Z 15 NOV TO 2000Z 19 NOV

	BEST TRACK			WARNING			ERRORS		24 HOUR FORECAST			ERRORS		48 HOUR FORECAST			ERRORS		72 HOUR FORECAST			ERRORS	
	POSIT		WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND	POSIT		WIND	DST	WIND
150800Z	6.0N	87.0E	50	6.1N	87.0E	50	6	0	6.6N	83.6E	65	107	-15	8.2N	80.7E	65	233	-30	--.-	---.-	--	--	--
152000Z	6.5N	85.7E	65	6.2N	84.8E	60	56	-5	7.7N	81.3E	70	206	-20	8.8N	78.4E	55	329	-45	--.-	---.-	--	--	--
160800Z	7.2N	85.3E	80	7.0N	85.0E	70	21	-10	7.9N	83.1E	80	162	-15	8.6N	81.2E	90	269	-15	--.-	---.-	--	--	--
162000Z	8.8N	84.6E	90	8.5N	84.5E	85	19	-5	10.0N	83.0E	100	108	0	11.5N	81.3E	100	157	-10	--.-	---.-	--	--	--
170800Z	10.5N	83.9E	95	10.4N	83.9E	95	6	0	13.0N	82.4E	100	12	-5	15.3N	81.5E	90	26	-20	--.-	---.-	--	--	--
172000Z	11.8N	83.1E	100	12.3N	82.9E	100	32	0	15.5N	81.4E	90	85	-20	18.3N	81.8E	40	80	-50	--.-	---.-	--	--	--
180800Z	13.0N	82.2E	105	13.3N	82.1E	110	19	5	15.9N	80.9E	100	27	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
182000Z	14.1N	81.7E	110	14.2N	81.4E	105	18	-5	16.6N	80.2E	80	58	-10	--.-	---.-	--	--	--	--.-	---.-	--	--	--
190800Z	15.5N	81.1E	110	15.5N	81.6E	105	29	-5	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--
192000Z	17.2N	81.0E	90	16.3N	79.7E	90	92	0	--.-	---.-	--	--	--	--.-	---.-	--	--	--	--.-	---.-	--	--	--

	ALL FORECASTS			
	WARNING	24-HR	48-HR	72-HR
AVERAGE FORECAST ERROR	30NM	96NM	182NM	0NM
AVERAGE RIGHT ANGLE ERROR	29NM	74NM	161NM	0NM
AVERAGE MAGNITUDE OF WIND ERROR	4KTS	12KTS	28KTS	0KTS
AVERAGE BIAS OF WIND ERROR	-3KTS	-12KTS	-28KTS	0KTS
NUMBER OF FORECASTS	10	8	6	0

CHAPTER VI — TROPICAL CYCLONE CENTER FIX DATA

1. INTRODUCTION

During the 1977 storm season, 2373 fixes on the 21 northwest Pacific area tropical cyclones and 180 fixes on the North Indian Ocean area tropical cyclones were collected at Fleet Weather Central/Joint Typhoon Warning Center, Guam. Table 6-1, Fix Platform Summary, delineates the number of fixes by platform for each tropical cyclone as well as season totals. A discussion of the various reconnaissance platforms is presented in Chapter II.

Fix totals as listed in Table 6-1 include all fixes received from primary and secondary sources whether real-time or after-the-fact of which all were used for post-storm analyses. Therefore, totals are in some instances, larger than those listed and evaluated in previous chapters of this report.

TABLE 6-1. FIX PLATFORM SUMMARY

	FIX PLATFORM							
	AIRCRAFT	DMSP	NOAA	SMS	LRDR	SHIP RADAR	ACR	TOTAL NO. OF FIXES
WESTERN PACIFIC								
TS PATSY	7	18	39	5	-	-	-	69
TD 02	4	22	5	-	-	-	-	31
TS RUTH	2	38	21	-	8	-	1	70
TD 04	2	21	6	2	-	-	-	31
TY SARAH	13	52	24	-	1	-	-	90
TY THELMA	10	74	22	-	20	-	-	126
TY VERA	13	54	26	-	67	-	-	160
TS WANDA	8	39	26	-	-	-	-	73
TS AMY	3	50	18	-	39	-	-	110
TY BABE	19	141	39[3]	-	88	-	-	287
TS CARLA	1	44	10[1]	-	-	-	-	55
TY DINAH	14	123	43[4]	-	41	4	-	225
TS EMMA	8	71	25[1]	-	14	-	-	118
TS FREDA	2	32	8[1]	-	11	1	-	54
TY GILDA	12	47	36[5]	-	-	-	-	95
TS HARRIET	11	36	21[4]	-	-	-	-	68
TY IVY	9	57	13[1]	-	-	-	-	79
TY JEAN	3	59	12[1]	-	-	-	-	74
TY KIM	31	71	51[3]	-	70	-	-	223
TY LUCY	19	64	43[1]	-	-	-	-	126
TY MARY	20	86	54[7]	23	26	-	-	209
TOTAL	211	1199	542[32]	30	385	5	1	2373
% OF TOTAL NO. OF FIXES	8.9%	50.5%	22.8%	1.26%	16.2%	.2%	.04%	100%
TROPICAL CYCLONE								
17-77		13	8					21
18-77		13	8					21
19-77		27	8					35
21-77		46	20[3]					66
22-77		26	11[2]					37
TOTAL		125	55[5]					180
% OF TOTAL NO. OF FIXES		69.4%	30.6%					100%

[ ] - FIXES RECEIVED FROM FWF SUITLAND IN END-OF-STORM SUMMARY PACKET AFTER BEST-TRACK COMPLETED AND ARE LISTED AT THE END OF SECTIONS 3 AND 4 RESPECTIVELY.

2. FORMAT

The fix data are divided into two groups by geographical area and sequentially ordered within each group. For all types of fixes, the first four columns tabulate information in the following format:

FIX NO. - Fixes are numbered sequentially.

TIME - Day, hour and minutes (GMT) of fix.

POSIT - Position of storm center in degrees and tenths.

FIXCAT - Type of fix used (SAT - satellite, P - aircraft penetration, LRDR - land radar, ACR - aircraft radar, SRDR - ship radar).

The format of the remainder of the print-out varies with the type of fix.

a. SATELLITE - Intensity estimates and trends from visual data (when available) are listed as derived from the Dvorak technique (NOAA TM; NESS - 45). Fix data from NOAA-4 and NOAA-5 satellites are appropriately labeled and indicate confidence numbers (CONF) if the U. S. Navy Fleet Weather Facility, Suitland, MD provided the data (see Table 6-2), or Position Code Number (PCN) if USAF DMSP sites provided the data. Fixes based on IR data are appropriately annotated with IR DATA. Geosynchronous Meteorological Satellite (SMS-2) data are noted as such and may contain occasional narrative comments and accuracy estimates.

b. RADAR - The latitude and longitude of the radar sites are given in the POSIT OF RADAR column. If available, plain language remarks regarding the size, accuracy, and echo characteristics of the fix appear as received. Radar data sites using the standard World Meteorological Organization (WMO) Code include a five-digit code group for reporting tropical cyclone characteristics of size, appearance and accuracy of location of the center or eye.

c. AIRCRAFT PENETRATION - Complete eye/center fix reports are obtained at levied fix times. Supplemental fixes are sometimes made during peripheral data gathering legs between scheduled fixes. These normally provide date, time and location only.

The categories of aircraft reconnaissance information are as follows:

(1) ACCRY (Accuracy): The estimated navigation (first number) and meteorological (second number) accuracies are expressed in nautical miles.

(2) FIX LVL (Fix level): A constant-pressure-surface flight level (listed in mb) is normally maintained during a tropical cyclone fix mission. Low-level missions are usually flown at 1500 feet (457 m). This altitude, however, is not normally constant due to maneuvers to avoid turbulence and to maintain visual contact of the ocean surface.

(3) MAX OBS FLT LVL WIND: Wind speed (knots) at flight level is measured by the AN/APN 147 doppler radar system aboard the WC-130 aircraft. Values entered in this category represent the maximum wind measured prior to obtaining a scheduled fix. This measurement may not represent the maximum flight level wind associated with the tropical cyclone because the aircraft only samples those portions of the tropical cyclone along the flight path. In many instances the flight path may be through the weak sector of the cyclone. In areas of heavy rainfall, the doppler radar may track energy reflected from precipitation rather than from the sea surface; thus preventing accurate wind speed measurement. In obvious cases such erroneous wind data will not be reported. In addition, the doppler radar system on the WC-130 re-

TABLE 6-2. CONFIDENCE (CONF) NUMBERS AS A FUNCTION OF DVORAK T NUMBER AND RADIUS OF 90% PROBABILITY AREA (NM).

TROPICAL CYCLONE INTENSITY	CONF (1)	CONF (2)	CONF (3)
T1.5	60	120	170
T2.0	60	120	170
T2.5	60	120	170
T3.0	50	100	150
T3.5	45	90	140
T4.0	45	90	140
T4.5	45	90	140
T5.0	40	90	130
T5.5	40	80	130
T6.0	40	80	130
T6.5	30	70	120
T7.0	30	70	120
T7.5	30	60	100
T8.0	30	60	100

stricts wind measurements to drift angles less than or equal to 27 degrees if the wind is normal to the aircraft heading.

(4) MAX OBS SFC WIND: The maximum surface wind (knots) is an estimate made by the Airborne Weather Reconnaissance Officer (ARWO) based on sea state. This observation is limited to the region of the flight path, and may not be representative of the entire storm. Availability of data is also dependent upon the absence of undercast conditions and the presence of adequate illumination. The positions of the maximum flight level wind and the maximum observed surface wind do not necessarily coincide.

(5) OBS MIN SLP: The minimum observed sea level pressure on a 700 mb fix mission is obtained by applying the minimum 700 mb height to the following regression equation:

$$SLP\ (MB) = .115\ (700\ mb\ HGT\ [M]) + 645$$

This relationship is accurate within ± 3 mb in most cases. However, if the 700 mb center and the surface center are not vertically alligned, the minimum sea level pressure will be erroneously high. If the surface center can be visually detected (e.g. in the eye), the minimum sea level pressure is obtained by a dropsonde released above the surface vortex center.

If the fix is made at the 1500 foot level, the sea level pressure is extrapolated from that level.

(6) MIN 700 MB HGT: The minimum height of the 700 mb surface in the vortex center is recorded in decameters.

(7) FLT LVL TI/TO: This category denotes the maximum temperature measured in the center (TI) and the ambient temperature outside the center (TO). The outside temperature is measured just prior to entering the wall cloud. Both temperature observations are in degrees Celsius and are made at flight level. Reconnaissance aircraft seldom penetrate on the same azimuth from one fix to another; thus, the position of TO normally varies both in bearing and range from the center.

(8) EYE FORM/ORIENTATION/DIA: The shape and diameter (nm) of the eye is determined by visual observation or by radar presentation analysis. This is reported only if the center is 50% or more surrounded by wall cloud. For elliptical eyes, the size of both major and minor axes are given in nm.

3. WESTERN NORTH PACIFIC FIX DATA

TROPICAL STORM PATSY
FIX POSITIONS FOR CYCLONE NO. 1
0600Z 23 MAR TO 0000Z 31 MAR

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	212124Z	1.1N 166.4E	SAT	(T2.0/2.0 / / HRS)						NOAA-5			(CONF 01)							
2	212129Z	1.5N 166.3E	SAT	(T1.0/1.0 / / HRS)					PCN 5	NOAA-5										
3	221005Z	1.6N 166.0E	SAT	(IR DATA)						NOAA-5			(CONF 02)							
4	221006Z	1.9N 166.1E	SAT	(IR DATA)						NOAA-5										
5	222051Z	2.9N 164.2E	SAT	(T2.0/2.0 / / HRS)					PCN 6	DMSP										
6	222239Z	4.0N 163.8E	SAT	(T2.5/2.5 /D0.5/25HRS)						NOAA-5			(CONF 02)							
7	222242Z	2.6N 164.2E	SAT	(IR DATA)						NOAA-5										
8	230237Z	2.6N 165.1E	P	15 5	1500	280	42	190	30	35	230	15	-	-	24 23	-	- -	-		1
9	230753Z	3.0N 163.5E	SAT	(IR DATA)					PCN 6	DMSP										
10	230921Z	3.5N 163.1E	SAT	(IR DATA)					PCN 6	NOAA-5										
11	230922Z	3.6N 162.1E	SAT	(IR DATA)					PCN 6	NOAA-5										
12	230924Z	3.5N 163.0E	SAT	(IR DATA)						NOAA-5			(CONF 02)							
13	232019Z	3.4N 163.5E	SAT	(IR DATA)						SMS-2										
14	232038Z	2.7N 164.5E	SAT	(T1.5/2.0 / / HRS)					PCN 6	DMSP										
15	232039Z	3.8N 162.2E	SAT	(T2.0/2.0 /S /24HRS)					PCN 6	DMSP										
16	232156Z	3.8N 162.5E	SAT	(T1.5/2.0 /W1.0/24HRS)						NOAA-5			(CONF 01)							
17	232158Z	3.6N 165.4E	SAT	(IR DATA)					PCN 3	NOAA-5										
18	232158Z	3.5N 165.0E	SAT	(T1.5/2.0 / / HRS)					PCN 6	NOAA-5										
19	240406Z	3.7N 164.8E	P	20 15	700	240	45	220	35	40	290	10	1002	313	10 10	-	- -	-		2
20	240741Z	3.9N 164.2E	SAT	(IR DATA)					PCN 6	DMSP										
21	240838Z	3.8N 165.1E	SAT	(IR DATA)					PCN 6	NOAA-5										
22	241034Z	3.7N 165.1E	SAT	(IR DATA)					PCN 6	NOAA-5										
23	241035Z	3.5N 163.0E	SAT	(IR DATA)						NOAA-5			(CONF 01)							
24	242027Z	4.1N 165.3E	SAT	(IR DATA)					PCN 6	DMSP										
25	242027Z	4.1N 165.5E	SAT	(T 0/1.0 /W1.5/24HRS)					PCN 6	DMSP										
26	242114Z	4.1N 165.5E	SAT	(T 0/1.0 /W2.0 /24HRS)					PCN 6	NOAA-5										
27	242114Z	4.1N 165.4E	SAT	(IR DATA)					PCN 6	NOAA-5										
28	250950Z	4.1N 165.3E	SAT	(IR DATA)					PCN 6	NOAA-5										
29	250950Z	2.3N 164.0E	SAT	(IR DATA)					PCN 6	NOAA-5										
30	252226Z	2.0N 163.0E	SAT	(T2.0/2.0 /D0.5/24HRS)						NOAA-5			(CONF 02)							
31	252226Z	2.0N 163.2E	SAT	(T2.0/2.0 /D2.0/24HRS)					PCN 5	NOAA-5										
32	260115Z	1.7N 163.2E	SAT	(T1.0/2.0 / / HRS)						SMS-2										
33	260858Z	2.1N 162.5E	SAT	(IR DATA)					PCN 6	DMSP										
34	260859Z	2.0N 162.3E	SAT	(IR DATA)					PCN 6	DMSP										
35	260906Z	2.2N 162.3E	SAT	(IR DATA)					PCN 6	NOAA-5										
36	262019Z	2.4N 161.8E	SAT	(T2.5/2.5 / / HRS)						SMS-2										
37	262142Z	3.5N 161.6E	SAT	(T3.0/3.0 /D1.0/24HRS)						NOAA-5			(CONF 01)							
38	262142Z	3.3N 161.5E	SAT	(T3.0/3.0 /D1.0/24HRS)					PCN 5	NOAA-5										
39	262142Z	2.9N 161.7E	SAT	(T2.5/2.5 / / HRS)					PCN 6	NOAA-5										
40	270115Z	3.7N 161.1E	SAT	(T3.0/3.0 /D2.0/24HRS)						SMS-2										
41	270846Z	4.1N 160.6E	SAT	(IR DATA)					PCN 6	DMSP										
42	270847Z	4.0N 160.2E	SAT	(IR DATA)					PCN 6	DMSP										
43	271018Z	4.2N 160.0E	SAT	(IR DATA)					PCN 5	NOAA-5										
44	272019Z	4.8N 159.0E	SAT	(T[illegible].5/2.5 /S /24HRS)						SMS-2										
45	27225[illegible]Z	5.6N 159.2E	SAT	(T4.5/4.5 /D1.5/24HRS)						NOAA-5			(CONF 02)							
46	272254Z	5.5N 159.3E	SAT	(IR DATA)					PCN 6	NOAA-5										
47	272255Z	5.3N 159.2E	SAT	(T3.5/3.5 /D0.5/25HRS)					PCN 5	NOAA-5										
48	272311Z	5.7N 159.1E	P	7 5	700	320	60	240	5	65	120	10	981	292	19 9	ELIP	N-S	15X10		4
49	280415Z	6.3N 158.4E	P	10 4	700	30	30	250	10	55	250	10	997	306	11 9	CIRC		15		5
50	280834Z	6.6N 158.4E	SAT	(IR DATA)					PCN 6	DMSP										
51	280835Z	6.2N 158.4E	SAT	(IR DATA)					PCN 6	DMSP										
52	280934Z	6.3N 158.2E	SAT	(IR DATA)					PCN 6	NOAA-5										
53	281435Z	6.9N 157.2E	P	10 4	700	230	50	150	10	-	-	-	999	308	15 11	-	- -	-		6
54	282125Z	7.1N 156.6E	SAT	(IR DATA)					PCN 5	DMSP										
55	282207Z	7.5N 156.5E	SAT	(T1.5/2.5 /W3.0/24HRS)						NOAA-5			(CONF 01)							
56	282211Z	7.1N 156.6E	SAT	(T3.5/3.5 /S /24HRS)					PCN 5	NOAA-5										
57	290400Z	8.1N 154.6E	P	4 25	700	200	28	90	80	20	70	30	1005	313	11 9	-	- -	-		7
58	290822Z	8.3N 154.8E	SAT	(IR DATA)					PCN 6	DMSP										
59	290853Z	9.0N 154.0E	SAT	(IR DATA)						NOAA-5			(CONF 02)							
60	291047Z	8.6N 154.6E	SAT	(IR DATA)					PCN 6	NOAA-5										
61	29144[illegible]Z	8.8N 153.8E	P	1 20	700	990	15	360	15	-	-	-	1003	312	11 10	-	- -	-		8
62	292107Z	8.2N 154.1E	SAT	(T1.0/1.0 / / HRS)					PCN 6	DMSP										
63	292108Z	8.6N 154.5E	SAT	(T1.0/2.0+ /W2.5 /23HRS)					PCN 5	DMSP										
64	292314Z	9.9N 154.5E	SAT	(T2.0/2.5 /D0.5 /25HRS)						NOAA-5			(CONF 01)							
65	292323Z	8.0N 155.0E	SAT	(IR DATA)					PCN 5	NOAA-5										
66	301003Z	8.2N 155.0E	SAT	(IR DATA)					PCN 6	NOAA-5										
67	301006Z	10.0N 154.3E	SAT	(IR DATA)						NOAA-5			(CONF-02)							
68	302056Z	8.0N 149.0E	SAT	(T 0/1.0 /W1.0/24HRS)					PCN 6	DMSP										
69	302234Z	9.6N 151.0E	SAT	(T1.0/1.5 /W1.0 /23HRS)						NOAA-5			(CONF-02)							

TROPICAL DEPRESSION 2
FIX POSITIONS FOR CYCLONE NO. 2
0000Z 26 MAY TO 0600Z 27 MAY

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIENTATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	232348Z	18.3N 124.8E	SAT	(T 0/ 0 / / HRS)					PCN 5	NOAA-5										
2	240206Z	18.3N 125.0E	SAT	(IR DATA)					PCN 5	DMSP										
3	242322Z	15.2N 128.2E	SAT	(T1.0/1.0 / / HRS)					PCN 5	DMSP										
4	250054Z	16.5N 128.5E	SAT	(T1.0/1.0 / / HRS)						NOAA-5		(CONF 01)								
5	250100Z	16.5N 128.4E	SAT	(T1.0/1.0 /D1.0/25HRS)					PCN 5	DMSP										
6	251025Z	16.6N 128.3E	SAT	(IR DATA)					PCN 5	DMSP										
7	251025Z	15.9N 127.7E	SAT	(IR DATA)					PCN 5	DMSP										
8	251140Z	16.3N 128.2E	SAT	(IR DATA)					PCN 6	DMSP										
9	251145Z	16.5N 128.0E	SAT							NOAA-5		(CONF 02)								
10	251440Z	17.0N 128.3E	SAT	(IR DATA)					PCN 6	DMSP										
11	252309Z	18.7N 127.4E	SAT	(T2.0/2.0-/D1.0/24HRS)					PCN 5	DMSP										
12	252310Z	18.5N 127.4E	SAT	(IR DATA)					PCN 5	DMSP										
13	260010Z	18.1N 127.5E	SAT							NOAA-5		(CONF 02)								
14	260017Z	19.8N 129.2E	SAT	(T2.0/2.0-/D1.0/23HRS)					PCN 3	DMSP										
15	260030Z	19.8N 128.7E	P	6 5	1500	180	30	100	40	35	130	60	1001	-	23 24	-	- -	-		1
16	260320Z	20.4N 129.0E	P	5 5	700	-	-	-	-	10	270	20	1001	310	13 13	-	- -	-		1
17	260322Z	20.6N 129.0E	SAT	(IR DATA)					PCN 3	DMSP										
18	260322Z	20.8N 129.1E	SAT	(IR DATA)					PCN 3	DMSP										
19	261056Z	21.8N 129.5E	SAT	(IR DATA)					PCN 5	DMSP										
20	261155Z	21.2N 129.4E	SAT	(IR DATA)					PCN 5	DMSP										
21	261155Z	22.0N 129.3E	SAT	(IR DATA)					PCN 5	DMSP										
22	261259Z	20.0N 126.9E	SAT	(IR DATA)						NOAA-5		(CONF 02)								
23	261604Z	21.8N 129.4E	SAT	(IR DATA)					PCN 5	DMSP										
24	261604Z	22.8N 129.8E	SAT	(IR DATA)					PCN 5	DMSP										
25	261811Z	23.3N 130.2E	P	5 15	700	210	28	110	30	-	-	-	1003	311	11 11	-	- -	-		2
26	262258Z	23.8N 130.5E	SAT	(IR DATA)					PCN 5	DMSP										
27	262258Z	21.5N 130.3E	SAT	(T2.0/2.0 /S /24HRS)					PCN 5	DMSP										
28	262333Z	24.5N 130.6E	SAT	(T1.0/2.0 /W1.0/24HRS)					PCN 5	DMSP										
29	270304Z	24.4N 131.0E	SAT	(T1.0/1.0- / / HRS)					PCN 5	DMSP										
30	270305Z	24.7N 130.8E	SAT	(IR DATA)					PCN 5	DMSP										
31	270415Z	25.3N 131.6E	P	5 2	1500	50	25	290	40	25	300	25	1003	-	23 23	-	- -	-		3

TROPICAL STORM RUTH
FIX POSITIONS FOR CYCLONE NO. 3
0600Z 14 JUN TO 1200Z 17 JUN

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	100051Z	5.3N 129.0E	SAT	(T1.0/1.0 / / HRS)			NOAA-5	(CONF 01)							
2	100055Z	6.3N 130.4E	SAT	(T 0/ 0 / / HRS)		PCN 5	NOAA-5								
3	101135Z	7.0N 128.2E	SAT	(IR DATA)		PCN 6	NOAA-5								
4	101138Z	8.5N 129.0E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
5	110008Z	7.5N 127.5E	SAT	(T1.0/1.0 /S /24HRS)			NOAA-5	(CONF 02)							
6	110011Z	7.2N 126.8E	SAT	(T1.0/1.0 /D1.0/24HRS)		PCN 5	NOAA-5								
7	110204Z	7.4N 127.2E	SAT	(IR DATA)		PCN 5	UMSP								
8	111247Z	8.8N 125.7E	SAT	(IR DATA)			NOAA-5								
9	111446Z	9.6N 124.3E	SAT	(IR DATA)		PCN 6	UMSP								
10	12011[illegible]Z	12.5N 123.5E	SAT	(T2.0/2.0 /D1.0/25HRS)			NOAA-5	(CONF 01)							
11	120123Z	13.1N 123.1E	SAT	(T 0/1.0 /W1.0/25HRS)		PCN 5	NOAA-5								
12	12032[illegible]Z	11.3N 122.5E	SAT	(T1.0/1.0 / / HRS)		PCN 5	UMSP								
13	1212[illegible]Z	11.9N 123.0E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
14	130034Z	13.1N 118.5E	SAT	(T 1.5/1.5 /W0.5 / 24 HRS)			NOAA-5	(CONF 02)							
15	130039Z	12.4N 119.0E	SAT	(T 0/ 0 /S /23HRS)		PCN 5	NOAA-5								
16	130310Z	12.9N 119.3E	SAT	(T2.0/2.0 /D1.0/24HRS)		PCN 5	UMSP								
17	131139Z	14.0N 117.9E	SAT			PCN 6	UMSP								
18	13114[illegible]Z	14.7N 118.1E	SAT	(IR DATA)		PCN 6	UMSP								
19	132242Z	15.6N 117.6E	SAT	(T2.5/2.5 / / HRS)		PCN 5	UMSP								
20	132242Z	14.8N 117.6E	SAT	(T2.5/2.5 / / HRS)		PCN 5	UMSP								
21	132242Z	14.9N 117.3E	SAT	(T3.0/3.0 /D1.0/20HRS)		PCN 5	UMSP								
22	140146Z	15.9N 117.0E	SAT	(T3.0/3.0 /D1. 5/25HRS)			NOAA-5	(CONF 02)							
23	141128Z	16.6N 116.8E	SAT	(IR DATA)		PCN 5	UMSP								
24	141239Z	17.0N 116.5E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
25	141355Z	16.8N 116.5E	SAT	(IR DATA)		PCN 6	NOAA-5								
26	141534Z	17.7N 116.5E	SAT	(IR DATA)		PCN 5	UMSP								
27	141535Z	18.0N 116.5E	SAT	(IR DATA)		PCN 6	UMSP								
28	142234Z	18.2N 116.6E	SAT	(T4.0/4.0 /D1.5/24HRS)		PCN 5	UMSP								
29	142234Z	17.2N 115.9E	SAT	(T3.5/3.5 /D1.0/24HRS)		PCN 6	UMSP								
30	142230Z	18.0N 116.2E	SAT	(IR DATA)		PCN 5	UMSP								
31	150012Z	18.2N 116.2E	SAT	(IR DATA)		PCN 5	UMSP								
32	150055Z	18.7N 116.8E	P	5 5	700	250 75 270 12	75 330 7	980	291	19 15	CIRC		20		1
33	150101Z	18.3N 116.6E	SAT	(T3.0/3.0 /S /23HRS)			NOAA-5	(CONF 01)							
34	150107Z	18.6N 116.9E	SAT	(IR DATA)		PCN 3	NOAA-5								
35	150402Z	19.2N 117.0E	P	1 5	700	190 52 140 30	80 60 10	980	291	22 12	-	- -	-		2
36	150417Z	19.2N 116.7E	SAT	(T4.0/4.0 / / HRS)		PCN 3	UMSP								
37	150620Z	19.6N 116.8E	LRDR	- 20800							-	- -	-	22.3N 114.2E	-
38	151115Z	19.8N 116.8E	SAT	(IR DATA)		PCN 6	UMSP								
39	151115Z	19.8N 116.9E	SAT	(IR DATA)		PCN 6	UMSP								
40	151115Z	19.5N 116.5E	SAT	(IR DATA)		PCN 6	UMSP								
41	151148Z	20.0N 116.8E	SAT	(IR DATA)		PCN 5	UMSP								
42	151508Z	21.0N 117.7E	LRDR	- 5////							-	- -	-	22.3N 114.2E	-
43	151517Z	20.5N 117.1E	SAT			PCN 5	UMSP								
44	151517Z	20.4N 117.4E	SAT	(IR DATA)		PCN 5	UMSP								
45	151517Z	20.8N 117.3E	SAT	(IR DATA)		PCN 5	UMSP								
46	151658Z	21.1N 117.2E	SAT	(IR DATA)		PCN 5	UMSP								
47	151722Z	21.1N 117.8E	AC R	-							-	- -	-	20.3N 175.0E	-
48	160000Z	21.3N 117.1E	SAT	(IR DATA)		PCN 3	UMSP								
49	160000Z	21.1N 117.5E	LRDR	- 65///							-	- -	-	22.3N 114.2E	-
50	160017Z	22.0N 116.9E	SAT	(T2.0/3.0 /W1.0/23HRS)			NOAA-5	(CONF 01)							
51	160024Z	22.2N 117.7E	SAT	(T3.0/4.0 / / HRS)		PCN 5	NOAA-5								
52	160359Z	22.8N 118.4E	SAT	(T4.0/4.0 / / HRS)		PCN 6	UMSP								
53	160359Z	22.8N 118.2E	SAT	(T3.0/3.5-/W0.5/30HRS)		PCN 5	UMSP								
54	160359Z	23.2N 118.3E	SAT	(T3.5/4.0 /W0.5/24HRS)		PCN 3	UMSP								
55	160500Z	22.9N 118.0E	LRDR	- 259///							-	- -	-	22.3N 114.2E	-
56	161103Z	23.9N 119.2E	SAT	(IR DATA)		PCN 6	UMSP								
57	161103Z	23.8N 118.7E	SAT			PCN 6	UMSP								
58	161103Z	23.5N 118.7E	SAT			PCN 6	UMSP								
59	161108Z	23.7N 118.3E	LRDR	- /////							-	- -	-	22.6N 120.3E	-
60	161208Z	23.9N 118.5E	LRDR	- /////							-	- -	-	22.6N 120.3E	-
61	161307Z	23.0N 118.0E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
62	161308Z	24.3N 118.8E	LRDR	- /////							-	- -	-	22.6N 120.3E	-
63	161408Z	24.6N 118.9E	LRDR	- /////							-	- -	-	22.6N 120.3E	-
64	161641Z	24.7N 119.4E	SAT	(IR DATA)		PCN 5	UMSP								
65	161641Z	23.7N 118.9E	SAT	(IR DATA)		PCN 5	UMSP								
66	162348Z	25.3N 119.2E	SAT	(T2.0/3.0-/W1.0/24HRS)		PCN 5	UMSP								
67	162348Z	25.2N 120.2E	SAT	(IR DATA)		PCN 5	UMSP								
68	170134Z	26.7N 120.6E	SAT	(T2.0/3.0-/W1.0/25HRS)		PCN 5	NOAA-5								
69	170342Z	26.6N 121.2E	SAT	(IR DATA)		PCN 5	UMSP								
70	170342Z	26.8N 121.5E	SAT	(T2.0/3.0-/W1.5/24HRS)		PCN 5	UMSP								

TROPICAL DEPRESSION 4
FIX POSITIONS FOR CYCLONE NO. 4
0000Z 05 JUL TO 0600Z 06 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	0212547	15.3N 120.6E	SAT	(IR DATA)						PCN 6 NOAA-5										
2	0223577	13.8N 116.5E	SAT	(T1.0/1.0 / / HRS)						PCN 5 UMSP										
3	0301317	11.9N 116.0E	SAT	(T1.0/1.0 / / HRS)						PCN 5 NOAA-5										
4	0304057	11.8N 116.1E	SAT	(IR DATA)						PCN 5 UMSP										
5	0312107	12.7N 115.9E	SAT	(IR DATA)						PCN 5 NOAA-5										
6	0316477	11.7N 114.1E	SAT	(IR DATA)						PCN 6 UMSP										
7	0323457	15.0N 113.0E	SAT	(IR DATA)						PCN 6 UMSP										
8	0323457	13.4N 113.5E	SAT	(T1.0/1.0 /S /24HRS)						PCN 5 UMSP										
9	0400477	16.5N 116.4E	SAT	(T1.0/1.0 /S /24HRS)						PCN 5 NOAA-5										
10	0403477	16.9N 115.7E	SAT	(T1.0/1.0 / / HRS)						PCN 5 UMSP										
11	0403477	15.2N 113.2E	SAT	(IR DATA)						PCN 5 UMSP										
12	0411277	17.7N 116.0E	SAT	(IR DATA)						PCN 6 NOAA-5										
13	0412307	18.3N 116.2E	SAT	(IR DATA)						PCN 5 UMSP										
14	0412307	14.6N 114.5E	SAT	(IR DATA)						PCN 5 UMSP										
15	0416297	18.4N 116.1E	SAT	(IR DATA)						PCN 6 UMSP										
16	0416297	17.6N 114.8E	SAT	(IR DATA)						PCN 5 UMSP										
17	0422227	17.8N 114.2E	P	10 30	1500	150	28	90	100	25	90	50	991	-	25 25	-	- -	-		3
18	0423337	18.1N 114.0E	SAT	(T1.0/1.0 /S /20HRS)						PCN 6 UMSP										
19	0423337	18.4N 112.7E	SAT	(T1.0/1.0 /S /24HRS)						PCN 5 UMSP										
20	0503307	18.1N 113.0E	SAT	(T2.0/2.0 /D1.0/28HRS)						PCN 3 UMSP										
21	0503307	18.5N 113.1E	SAT	(IR DATA)						PCN 5 UMSP										
22	0503487	17.5N 133.1E	P	10 10	700	170	30	70	150	30	70	150	995	304	11 -	-	- -	-		4
23	0512197	20.1N 111.9E	SAT	(IR DATA)						PCN 5 UMSP										
24	0512197	20.0N 110.5E	SAT	(IR DATA)						PCN 5 UMSP										
25	0512397	20.3N 111.3E	SAT	(IR DATA)						PCN 5 NOAA-5										
26	0512467	19.0N 111.5E	SAT	(IR DATA)						SMS-2			(CONF 01)							
27	0516127	20.4N 111.5E	SAT	(IR DATA)						PCN 6 UMSP										
28	0516127	19.5N 110.5E	SAT	(IR DATA)						PCN 6 UMSP										
29	0523217	22.0N 109.6E	SAT	(T 0/1.0 /W1.0/24HRS)						PCN 5 UMSP										
30	0601157	22.5N 110.2E	SAT	(T 0/1.0 / / HRS)						PCN 5 UMSP										
31	0601197	20.9N 109.4E	SAT	(T1.0/1.0 / / HRS)						SMS-2			(CONF 01)							

TYPHOON SARAH
FIX POSITIONS FOR CYCLONE NO. 5
1200Z 16 JUL TO 1200Z 21 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	130000Z	6.7N 137.5E	SAT	(T 0/ 0 / / HRS)			PCN 5 NOAA-5								
2	131040Z	7.7N 138.2E	SAT	(IR DATA)			PCN 5 NOAA-5								
3	132316Z	8.0N 136.9E	SAT	(T 0/ 0 /S /23HRS)			PCN 5 NOAA-5								
4	140233Z	7.8N 136.8E	SAT	(IR DATA)			PCN 5 DMSP								
5	141152Z	7.2N 134.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
6	142147Z	7.5N 132.7E	SAT	(IR DATA)			PCN 5 DMSP								
7	150026Z	6.2N 130.0E	SAT	(T2.0/2.0 / / HRS)			NOAA-5	(CONF 02)							
8	150029Z	6.7N 132.3E	SAT	(T 0/ 0 /S /25HRS)			PCN 5 NOAA-5								
9	150215Z	7.0N 132.6E	SAT	(IR DATA)			PCN 5 DMSP								
10	150215Z	6.2N 132.0E	SAT	(T1.0/1.5 / / HRS)			PCN 5 DMSP								
11	151029Z	9.2N 130.5E	SAT	(IR DATA)			PCN 5 DMSP								
12	151029Z	7.6N 129.8E	SAT	(IR DATA)			PCN 5 DMSP								
13	151108Z	7.5N 129.6E	SAT	(IR DATA)			PCN 5 NOAA-5								
14	151110Z	7.3N 132.0E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
15	151457Z	7.8N 128.6E	SAT	(IR DATA)			PCN 5 DMSP								
16	151457Z	8.0N 128.6E	SAT	(IR DATA)			PCN 5 DMSP								
17	152130Z	9.2N 126.9E	SAT	(IR DATA)			PCN 5 DMSP								
18	152130Z	8.4N 127.1E	SAT	(T2.0/2.0 /D1.0/19HRS)			PCN 4 DMSP								
19	152301Z	9.1N 126.7E	SAT	(IR DATA)			PCN 5 DMSP								
20	152342Z	8.3N 126.4E	SAT	(T3.0/3.0 /D1.0/23HRS)			NOAA-5	(CONF 01)							
21	152345Z	9.0N 126.5E	SAT	(T2.0/2.0 /D2.0/23HRS)			PCN 5 NOAA-5								
22	160042Z	9.3N 130.4E	P	5 5	1500	70 30 350 100	30 350 70	1002	-	22 23	-	- -	-		1
23	160158Z	9.4N 130.5E	SAT	(IR DATA)			PCN 5 DMSP								
24	160644Z	9.9N 129.4E	P	7 12	700	120 22 60 35	20 40 30	1001	-	23 23	-	- -	-		2
25	160943Z	10.2N 128.8E	P	5 7	700	180 38 100 105	25 100 95	1002	309	13 12	-	- -	-		3
26	161012Z	10.4N 127.8E	SAT				PCN 5 DMSP								
27	161012Z	10.1N 127.1E	SAT				PCN 6 DMSP								
28	161221Z	10.6N 127.5E	SAT	(IR DATA)			PCN 5 NOAA-5								
29	162249Z	12.2N 124.9E	SAT	(T2.0/2.0 / / HRS)			PCN 6 DMSP								
30	162249Z	12.2N 125.0E	SAT	(T2.5/2.5 / / HRS)			PCN 5 DMSP								
31	162254Z	11.6N 125.5E	SAT	(T3.0/3.0 /D1.0/25HRS)			PCN 4 DMSP								
32	170045Z	12.1N 125.3E	P	5 10	700	210 30 150 50	30 150 50	-	-	13 11	-	- -	-		4
33	170052Z	12.4N 125.0E	SAT	(T3.5/3.5 /D0.5/25HRS)			NOAA-5	(CONF 02)							
34	170057Z	12.3N 125.0E	SAT	(T3.0/3.0 /D1.0/25HRS)			PCN 5 NOAA-5								
35	170415Z	12.7N 125.2E	P	2 7	700	250 42 190 35	30 120 30	989	299	11 11	-	- -	-		5
36	170938Z	13.4N 124.0E	P	3 10	500	200 32 110 20	- - -	-	-	-3 -2	-	- -	-		5
37	170955Z	12.8N 123.4E	SAT	(IR DATA)			PCN 6 DMSP								
38	170955Z	12.9N 123.2E	SAT	(IR DATA)			PCN 4 DMSP								
39	171133Z	13.4N 123.7E	SAT	(IR DATA)			PCN 6 DMSP								
40	171133Z	13.3N 123.3E	SAT	(IR DATA)			PCN 4 DMSP								
41	171137Z	13.4N 123.3E	SAT	(IR DATA)			PCN 6 NOAA-5								
42	171147Z	14.0N 123.7E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
43	171604Z	13.8N 123.7E	SAT	(IR DATA)			PCN 6 DMSP								
44	171604Z	14.1N 123.3E	SAT	(IR DATA)			PCN 3 DMSP								
45	171632Z	13.6N 122.7E	P	2 12	500	160 42 60 120	- - -	-	-	2 2	-	- -	-		6
46	172139Z	13.8N 121.6E	P	2 12	500	260 30 170 180	- - -	-	-	-3 -3	-	- -	-		6
47	172234Z	15.0N 121.1E	SAT	(T3.0/3.0+/ S /22 HRS)			PCN 5 DMSP								
48	172237Z	14.6N 121.4E	SAT	(T3.0/3.0 /D1.0/24HRS)			PCN 5 DMSP								
49	172237Z	14.2N 121.9E	SAT	(T4.0/4.0-/D1.0/24HRS)			PCN 3 DMSP								
50	180013Z	15.4N 120.9E	SAT	(IR DATA)			PCN 5 NOAA-5								
51	180422Z	15.6N 121.2E	P	5 10	700	80 40 330 40	- - -	-	-	+3 +5	-	- -	-		7
52	180430Z	15.5N 121.3E	LRDR	-							-	- -	-	15.2N 120.6E	-
53	181030Z	16.2N 118.7E	P	5 5	700	200 33 170 80	50 90 20	-	303	12 11	-	- -	-		7
54	181119Z	15.8N 118.1E	SAT	(IR DATA)			PCN 5 DMSP								
55	181119Z	15.6N 118.7E	SAT	(IR DATA)			PCN 6 DMSP								
56	181121Z	16.3N 118.0E	SAT	(IR DATA)			PCN 5 DMSP								
57	181249Z	16.1N 117.6E	SAT	(IR DATA)			PCN 5 NOAA-5								
58	181546Z	16.4N 117.2E	SAT	(IR DATA)			PCN 5 DMSP								
59	181546Z	16.3N 117.2E	SAT	(IR DATA)			PCN 6 DMSP								
60	181546Z	16.0N 116.1E	SAT	(IR DATA)			PCN 6 DMSP								
61	181623Z	16.3N 117.3E	P	3 12	700	160 40 60 80	- - -	991	301	11 12	-	- -	-		8
62	182130Z	17.0N 116.3E	P	2 5	700	130 55 30 50	50 70 30	991	301	12 13	-	- -	-		8
63	182220Z	16.9N 115.7E	SAT	(T3.5/3.5 /D0.5/24HRS)			PCN 5 DMSP								
64	190006Z	17.1N 116.0E	SAT	(IR DATA)			PCN 6 DMSP								
65	190054Z	17.0N 116.0E	SAT	(T3.5/3.5 / / HRS)			NOAA-5	(CONF 02)							
66	190125Z	17.0N 115.4E	SAT	(IR DATA)			PCN 5 NOAA-5								
67	190428Z	17.0N 114.9E	SAT	(T4.0/4.0+/S /30HRS)			PCN 3 DMSP								
68	190432Z	16.9N 114.0E	P	10 6	700	110 58 360 55	70 360 55	984	295	13 12	-	- -	-		9
69	191102Z	17.2N 113.0E	SAT	(IR DATA)			PCN 4 DMSP								
70	191102Z	16.9N 112.3E	SAT	(IR DATA)			PCN 2 DMSP								
71	191102Z	17.3N 112.7E	SAT	(IR DATA)			PCN 4 DMSP								
72	191205Z	17.1N 112.9E	SAT				PCN 3 NOAA-5								
73	191359Z	17.6N 112.0E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
74	191528Z	17.3N 112.4E	SAT	(IR DATA)			PCN 5 DMSP								
75	191528Z	17.7N 112.4E	SAT				PCN 5 DMSP								
76	192345Z	17.6N 112.2E	SAT	(T5.0/5.0-/D1.0/20HRS)			PCN 3 DMSP								
77	200010Z	17.4N 111.5E	SAT	(T4.5/4.5 /D1.0/23HRS)			NOAA-5	(CONF 01)							
78	200041Z	17.7N 112.0E	SAT	(T5.0/5.0 / / HRS)			PCN 1 NOAA-5								
79	200411Z	18.4N 111.8E	SAT	(T4.0/4.0-/ / HRS)			PCN 2 DMSP								
80	200411Z	18.1N 111.7E	SAT	(IR DATA)			PCN 1 DMSP								
81	201227Z	18.8N 110.1E	SAT	(IR DATA)			PCN 4 DMSP								
82	201652Z	19.1N 108.7E	SAT	(IR DATA)			PCN 1 DMSP								
83	201652Z	19.1N 109.7E	SAT	(IR DATA)			PCN 2 DMSP								
84	202328Z	20.3N 108.8E	SAT	(T3.0/4.0-/W1.0/19HRS)			PCN 4 DMSP								
85	202328Z	20.2N 108.8E	SAT	(T4.5/5.0-/W0.5/24HRS)			PCN 1 DMSP								
86	210154Z	20.5N 108.0E	SAT	(T3.5/4.5 /W1.5/23HRS)			PCN 1 NOAA-5								
87	210352Z	20.4N 107.6E	SAT	(IR DATA)			PCN 4 DMSP								
88	210352Z	20.4N 107.8E	SAT	(IR DATA)			PCN 1 DMSP								
89	211209Z	21.2N 105.6E	SAT	(IR DATA)			PCN 4 DMSP								
90	211210Z	20.8N 105.4E	SAT	(IR DATA)			PCN 3 DMSP								

TYPHOON THELMA
FIX POSITIONS FOR CYCLONE NO. 6
0000Z 21 JUL TO 0000Z 26 JUL

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	192203Z	13.0N 129.5E	SAT	(T 0/ 0 / / HRS)						PCN 5 DMSP										
2	192203Z	13.7N 129.5E	SAT	(T 0/ 0 / / HRS)						PCN 6 DMSP										
3	192203Z	13.6N 133.7E	SAT	(T1.0/1.0 / / HRS)						PCN 5 DMSP										
4	200145Z	13.8N 130.1E	SAT	(IR DATA)						PCN 5 DMSP										
5	200228Z	13.5N 133.9E	SAT	(IR DATA)						PCN 5 DMSP										
6	201040Z	13.2N 132.1E	SAT	(IR DATA)						PCN 6 DMSP										
7	201121Z	14.5N 131.2E	SAT	(IR DATA)						PCN 5 NOAA-5										
8	201125Z	15.0N 131.5E	SAT	(IR DATA)						NOAA-5		(CONF 01)								
9	202146Z	14.4N 130.9E	SAT	(T2.0/2.0 /D2.0/24HRS)						PCN 5 DMSP										
10	202146Z	14.2N 130.5E	SAT	(T2.0/2.0 /D2.0/24HRS)						PCN 5 DMSP										
11	202146Z	14.9N 130.0E	SAT	(T2.0/2.0 /D1.0/24HRS)						PCN 5 DMSP										
12	202357Z	14.6N 130.2E	SAT	(IR DATA)						PCN 5 NOAA-5										
13	210211Z	14.8N 129.7E	SAT	(IR DATA)						PCN 5 DMSP										
14	210211Z	15.4N 129.9E	SAT	(IR DATA)						PCN 5 DMSP										
15	210211Z	15.3N 129.8E	SAT	(IR DATA)						PCN 5 DMSP										
16	210914Z	15.6N 128.5E	P	1 5	700	170	50	130	150	55	130	30	993	303	14 10	-	- -	-		1
17	211027Z	15.5N 128.2E	SAT	(IR DATA)						PCN 5 DMSP										
18	211027Z	15.6N 128.6E	SAT	(IR DATA)						PCN 6 DMSP										
19	211028Z	15.7N 128.3E	SAT	(IR DATA)						PCN 5 DMSP										
20	211054Z	15.6N 128.2E	P	3 10	700	-	-	-	-	-	-	-	997	306	15 -	-	- -	-		1
21	211234Z	15.5N 127.9E	SAT	(IR DATA)						PCN 6 NOAA-5										
22	211234Z	15.2N 127.3E	SAT	(IR DATA)						NOAA-5		(CONF 01)								
23	211453Z	15.7N 127.7E	SAT	(IR DATA)						PCN 6 DMSP										
24	211453Z	15.3N 127.7E	SAT	(IR DATA)						PCN 6 DMSP										
25	211511Z	15.5N 128.0E	P	3 10	700	290	33	210	50	-	-	-	985	290	13 13	-	- -	-		2
26	212129Z	15.9N 127.7E	SAT	(T3.5/3.5 /D1.5/24HRS)						PCN 3 DMSP										
27	212129Z	15.9N 128.0E	SAT	(T3.0/3.0 /D1.0/24HRS)						PCN 5 DMSP										
28	212129Z	16.0N 127.7E	SAT	(T3.0/3.0 /D1.0/24HRS)						PCN 3 DMSP										
29	220110Z	16.1N 127.7E	SAT	(IR DATA)						PCN 3 NOAA-5										
30	220331Z	16.4N 126.7E	P	5 5	700	190	40	150	220	50	180	20	987	298	17 12	CIRC		60		3
31	220335Z	17.2N 127.1E	SAT	(IR DATA)						PCN 5 DMSP										
32	220335Z	16.5N 126.9E	SAT	(IR DATA)						PCN 5 DMSP										
33	221011Z	17.0N 125.7E	SAT	(IR DATA)						PCN 5 DMSP										
34	221011Z	17.5N 125.0E	SAT							PCN 4 DMSP										
35	221133Z	17.1N 125.4E	SAT	(IR DATA)						PCN 6 DMSP										
36	22115 Z	17.3N 125.1E	SAT	(IR DATA)						PCN 5 NOAA-5										
37	221435Z	17.0N 125.0E	SAT	(IR DATA)						PCN 4 DMSP										
38	221436Z	17.3N 124.9E	SAT	(IR DATA)						PCN 5 DMSP										
39	221546Z	17.0N 124.8E	P	3 5	700	200	55	110	50	-	-	-	973	285	16 13	CIRC		20		4
40	222050Z	17.3N 124.3E	P	3 3	700	40	60	360	8	-	-	-	965	279	14 11	ELIP	N-S	15X10		4
41	222253Z	17.7N 124.1E	SAT	(T4.0/4.0 /D1.0/25HRS)						PCN 3 DMSP										
42	222254Z	17.5N 124.2E	SAT	(T4.0/4.0 /D1.0/25HRS)						PCN 5 DMSP										
43	222254Z	17.5N 124.2E	SAT	(T4.0/4.0 / / HRS)						PCN 4 DMSP										
44	222318Z	17.6N 123.8E	SAT	(IR DATA)						PCN 6 DMSP										
45	230024Z	17.7N 123.8E	SAT	(T4.5/4.5 / / HRS)						PCN 3 NOAA-5										
46	230216Z	17.6N 122.5E	SAT	(T4.5/4.5 / / HRS)						NOAA-5		(CONF 02)								
47	230300Z	17.5N 123.4E	LRDR	- 3260/												-	- -	-		-
48	230318Z	18.1N 123.5E	SAT	(IR DATA)						PCN 1 DMSP										
49	230313Z	18.2N 123.4E	SAT	(T4.0/4.0 / / HRS)						PCN 1 DMSP										
50	230314Z	17.9N 123.5E	SAT	(IR DATA)						PCN 1 DMSP										
51	230314Z	18.2N 123.5E	SAT	(IR DATA)						PCN 1 DMSP										
52	230319Z	18.1N 123.4E	SAT	(IR DATA)						PCN 1 DMSP										
53	230322Z	18.1N 123.4E	P	3 4	700	120	84	50	15	100	50	15	960	274	15 14	CIRC		8		5
54	230400Z	17.7N 123.3E	LRDR	- 20610												-	- -	-		-
55	230500Z	17.8N 123.2E	LRDR	- 21640												-	- -	-		-
56	230600Z	18.0N 123.1E	LRDR	- 21610												-	- -	-		-
57	230700Z	18.4N 122.6E	LRDR	- 20611												-	- -	-		-
58	230800Z	18.6N 122.5E	LRDR	- 20451												-	- -	-		-
59	231106Z	18.3N 122.2E	SAT	(IR DATA)						PCN 3 NOAA-5										
60	231135Z	18.8N 122.2E	SAT	(IR DATA)						PCN 4 DMSP										
61	231135Z	18.8N 122.5E	SAT	(IR DATA)						PCN 4 DMSP										
62	231201Z	18.8N 122.5E	SAT	(IR DATA)						PCN 3 DMSP										
63	231202Z	18.8N 122.3E	SAT	(IR DATA)						PCN 3 DMSP										
64	231302Z	18.7N 122.1E	SAT	(IR DATA)						PCN 4 NOAA-5										
65	231550Z	19.0N 121.8E	SAT	(IR DATA)						PCN 2 DMSP										
66	231559Z	19.0N 121.5E	P	2 2	700	180	60	140	30	-	-	-	963	270	15 16	ELIP	N-S	5X 3		6
67	231600Z	19.0N 121.5E	SAT	(IR DATA)						PCN 1 DMSP										
68	231600Z	19.2N 121.8E	SAT	(IR DATA)						PCN 3 DMSP										
69	232135Z	19.6N 120.9E	P	1 3	700	340	55	270	40	75	270	10	964	271	16 13	ELIP	N-S	35X25		6
70	232236Z	19.5N 121.0E	SAT	(IR DATA)						PCN 3 DMSP										
71	23223 Z	19.3N 120.7E	SAT	(T5.0/5.0 /D1.0/24HRS)						PCN 1 DMSP										
72	232305Z	19.4N 120.8E	SAT	(T5.0/5.0 / / HRS)						PCN 1 DMSP										
73	232306Z	19.4N 121.1E	SAT	(T5.0/5.0 /D1.0/24HRS)						PCN 3 DMSP										
74	240100Z	19.6N 120.7E	LRDR	- 5////												-	- -	-	22.6N 120.3E	-
75	240100Z	19.7N 120.4E	LRDR	- 5////												-	- -	-	18.1N 120.5E	-
76	240131Z	18.6N 120.2E	SAT	(T5.0/5.0 /D0.5/23HRS)						NOAA-5		(CONF 01)								
77	240138Z	19.7N 120.7E	SAT	(IR DATA)						PCN 1 NOAA-5										
78	240200Z	19.7N 120.4E	LRDR	-												-	- -	-		-
79	240300Z	19.8N 120.3E	SAT	(IR DATA)						PCN 2 DMSP										
80	240300Z	19.8N 120.3E	SAT	(T5.0/5.0 /D1.0/24HRS)						PCN 1 DMSP										
81	240300Z	19.9N 120.2E	SAT	(IR DATA)						PCN 1 DMSP										
82	240500Z	19.8N 120.2E	LRDR	- 5////												-	- -	-	22.6N 120.3E	-
83	240600Z	19.9N 120.2E	LRDR	- 5////												-	- -	-	22.6N 120.3E	-
84	240700Z	20.0N 120.1E	LRDR	- 5////												-	- -	-	22.6N 120.3E	-
85	240900Z	20.3N 119.8E	LRDR	- 5////												-	- -	-	22.6N 120.3E	-
86	240942Z	20.5N 119.8E	P	3 5	700	270	80	190	15	80	310	9	958	272	20 10	-	- -	-		7
87	241100Z	20.5N 119.7E	LRDR	- 5////												-	- -	-	22.6N 120.3E	-
88	241119Z	20.1N 119.5E	SAT	(IR DATA)						PCN 6 DMSP										
89	241150Z	20.1N 119.4E	SAT	(IR DATA)						PCN 6 DMSP										
90	241150Z	20.1N 119.7E	SAT	(IR DATA)						PCN 3 DMSP										

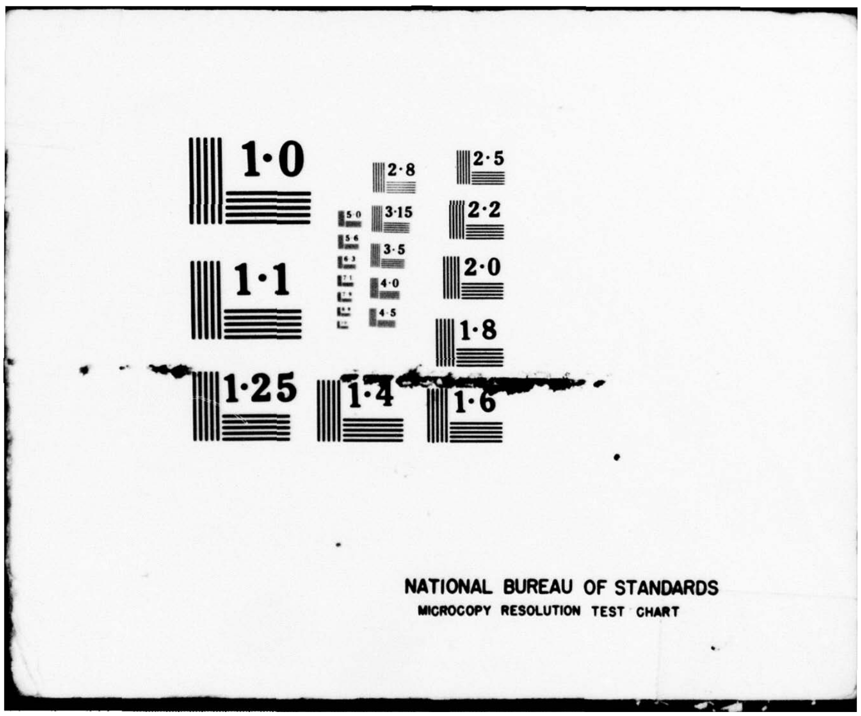
91	241200Z	20.5N	119.6E	LRDR	- 4////				-	-	-	-	22.6N	120.3E	-
92	241219Z	20.5N	119.6E	SAT	(IR DATA)	PCN 3	NOAA-5								
93	241249Z	20.6N	119.6E	SAT	(IR DATA)		NOAA-5	(CONF 02)							
94	241400Z	20.6N	119.6E	LRDR	- 4////				-	-	-	-	22.6N	120.3E	-
95	241542Z	22.0N	119.6E	SAT	(IR DATA)	PCN 3	DMSP								
96	241542Z	20.7N	119.3E	SAT	(IR DATA)	PCN 3	DMSP								
97	241600Z	21.0N	119.8E	LRDR	- 4////				-	-	-	-	22.6N	120.3E	-
98	241700Z	22.1N	119.8E	LRDR	- 4////				-	-	-	-	22.6N	120.3E	-
99	241800Z	21.4N	119.8E	LRDR	- 1020/				-	-	-	-	22.6N	120.3E	-
100	242219Z	21.8N	120.0E	SAT	(T5.0/5.0-/S /23HRS)	PCN 1	DMSP								
101	242219Z	21.6N	120.2E	SAT	(T5.0/5.0 /S /24HRS)	PCN 1	DMSP								
102	242253Z	22.0N	120.1E	SAT	(IR DATA)	PCN 1	DMSP								
103	242253Z	22.2N	120.1E	SAT	(IR DATA)	PCN 1	DMSP								
104	242300Z	21.7N	119.9E	LRDR	- 10535				-	-	-	-	22.6N	120.3E	-
105	250045Z	22.7N	120.0E	SAT	(T4.5/4.5 /W0.5/23HRS)		NOAA-5	(CONF 01)							
106	250054Z	22.4N	120.4E	SAT	(IR DATA)	PCN 1	NOAA-5								
107	250242Z	22.0N	122.3E	SAT	(T5.0/5.0 / / HRS)	PCN 1	DMSP								
108	250243Z	22.9N	120.2E	SAT	(IR DATA)	PCN 3	DMSP								
109	250243Z	23.1N	120.1E	SAT	(T4.0/5.0-/W1.0/24HRS)	PCN 3	DMSP								
110	250243Z	22.9N	120.3E	SAT	(T5.0/5.0 /S /28HRS)	PCN 3	DMSP								
111	251101Z	24.1N	120.1E	SAT	(IR DATA)	PCN 6	DMSP								
112	251101Z	24.1N	120.2E	SAT	(IR DATA)	PCN 6	DMSP								
113	251134Z	24.0N	119.9E	SAT	(IR DATA)	PCN 5	NOAA-5								
114	251138Z	24.0N	120.0E	SAT	(IR DATA)	PCN 3	DMSP								
115	251142Z	23.7N	121.0E	SAT	(IR DATA)		NOAA-5	(CONF 01)							
116	251524Z	25.8N	122.2E	SAT	(IR DATA)	PCN 5	DMSP								
117	251525Z	25.3N	120.0E	SAT	(IR DATA)	PCN 6	DMSP								
118	252202Z	27.1N	119.5E	SAT	(T2.5/3.5-/W2.5/24HRS)	PCN 5	DMSP								
119	252202Z	26.1N	119.8E	SAT	(T3.5/4.5-/W1.5/24HRS)	PCN 6	DMSP								
120	252202Z	26.6N	120.4E	SAT	(T3.5/4.5-/W1.5/19HRS)	PCN 6	DMSP								
121	252202Z	27.1N	119.6E	SAT	(IR DATA)	PCN 6	DMSP								
122	260001Z	26.0N	121.6E	SAT	(T3.5/4.0 /W1.0/23HRS)		NOAA-5	(CONF 01)							
123	260010Z	27.4N	119.3E	SAT	(IR DATA)	PCN 5	NOAA-5								
124	260225Z	28.1N	119.4E	SAT	(IR DATA)	PCN 5	DMSP								
125	260227Z	28.[illegible]N	119.[illegible]E	SAT	(IR DATA)	PCN 3	DMSP								
126	270123Z	33.1N	116.5E	SAT	(IR DATA)	PCN 5	NOAA-5								

AD-A055 512 FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER FP--ETC F/G 4/2
ANNUAL TYPHOON REPORT 1977.(U)
1977 D R MORFORD, J K LAVIN

UNCLASSIFIED NL

2 OF 2
ADA
055512

END
DATE
FILMED
8 -78
DDC


1·0
1·1
1·25
1·4
1·6
1·8
2·0
2·2
2·5
2·8
3·15
3·5
4·0
4·5
5·0
5·6
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

TYPHOON VERA
FIX POSITIONS FOR CYCLONE NO. 7
0000Z 28 JUL TO 0600Z 01 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	260010Z	26.5N 130.6E	SAT	(T 0/ 0 / / HRS)						PCN 5 NOAA-5										
2	261050Z	24.9N 131.7E	SAT	(IR DATA)						PCN 6 NOAA-5										
3	262145Z	25.4N 131.7E	SAT	(T1.0/1.0+/ D1.0/22 HRS)						PCN 5 DMSP										
4	262326Z	25.6N 131.6E	SAT	(IR DATA)						PCN 5 NOAA-5										
5	270123Z	25.5N 131.5E	SAT	(IR DATA)						PCN 5 NOAA-5										
6	271027Z	25.5N 130.7E	SAT	(IR DATA)						PCN 5 DMSP										
7	271027Z	25.5N 131.4E	SAT	(IR DATA)						PCN 4 DMSP										
8	271203Z	25.4N 131.1E	SAT	(IR DATA)						PCN 5 NOAA-5										
9	271449Z	25.8N 130.8E	SAT	(IR DATA)						PCN 5 DMSP										
10	271449Z	25.6N 131.1E	SAT	(IR DATA)						PCN 5 DMSP										
11	272127Z	25.6N 129.6E	SAT	(T2.0/2.0 / / HRS)						PCN 3 DMSP										
12	272128Z	25.5N 129.6E	SAT	(T2.5/2.5 /D1.5/24HRS)						PCN 5 DMSP										
13	272128Z	25.5N 130.4E	SAT	(T3.0/3.0 / / HRS)						PCN 3 DMSP										
14	280032Z	25.2N 129.8E	SAT	(T2.0/2.0 / / HRS)						NOAA-5			(CONF 01)							
15	280039Z	25.5N 129.6E	SAT	(IR DATA)						PCN 5 NOAA-5										
16	280208Z	25.4N 130.3E	P	3 5	1500	-	-	-	-	40	350	25	988	-	25 26	-	- -	-		1
17	280318Z	25.5N 130.2E	P	5 5	700	-	-	-	-	40	330	35	987	298	13 13	-	- -	-		1
18	281010Z	25.4N 129.3E	SAT	(IR DATA)						PCN 4 DMSP										
19	281039Z	25.1N 129.4E	P	2 5	700	240	50	140	70	50	270	30	987	297	15 14	-	- -	-		2
20	281101Z	25.4N 129.6E	SAT	(IR DATA)						PCN 4 DMSP										
21	281101Z	25.4N 129.5E	SAT	(IR DATA)						PCN 3 DMSP										
22	281118Z	25.3N 129.5E	SAT	(IR DATA)						PCN 3 NOAA-5										
23	281119Z	26.0N 130.2E	SAT	(IR DATA)						PCN 4 NOAA-5										
24	281432Z	25.5N 128.9E	SAT	(IR DATA)						PCN 3 DMSP										
25	281432Z	25.3N 129.2E	SAT	(IR DATA)						PCN 4 DMSP										
26	281440Z	25.3N 129.1E	P	2 5	700	40	50	340	8	-	-	-	986	296	14 12	-	- -	-		2
27	281613Z	25.2N 129.1E	SAT	(IR DATA)						PCN 3 DMSP										
28	281613Z	25.3N 128.9E	SAT	(IR DATA)						PCN 5 DMSP										
29	282111Z	24.9N 128.5E	SAT	(T3.5/3.5-/D1.0/24HRS)						PCN 3 DMSP										
30	282111Z	25.2N 128.3E	SAT	(T3.5/3.5 /D0.5/24HRS)						PCN 3 DMSP										
31	282155Z	24.8N 128.4E	P	2 3	700	110	55	100	55	-	-	-	977	289	15 11	-	- -	-		3
32	282355Z	24.8N 128.1E	SAT	(IR DATA)						PCN 3 NOAA-5										
33	282357Z	25.0N 128.0E	SAT	(T3.5/3.5 /D1.5/24HRS)						NOAA-5			(CONF 01)							
34	290314Z	24.8N 127.8E	SAT	(IR DATA)						PCN 1 DMSP										
35	290314Z	24.8N 127.8E	SAT	(T4.5/4.5 / / HRS)						PCN 1 DMSP										
36	290314Z	24.9N 128.4E	SAT	(T4.0/4.0 / / HRS)						PCN 1 DMSP										
37	290315Z	24.8N 127.9E	P	2 3	700	10	65	300	10	60	300	25	972	285	16 10	CIRC		16		3
38	290341Z	24.8N 127.8E	SAT	(IR DATA)						PCN 1 DMSP										
39	290932Z	24.3N 126.8E	P	4 3	700	140	90	045	15	70	250	10	950	265	18 14	CIRC		8		4
40	290953Z	24.4N 126.7E	SAT	(IR DATA)						PCN 1 DMSP										
41	290953Z	24.5N 126.8E	SAT	(IR DATA)						PCN 1 DMSP										
42	291035Z	24.4N 126.8E	SAT	(IR DATA)						PCN 4 NOAA-5										
43	291223Z	24.0N 126.7E	SAT	(IR DATA)						PCN 4 NOAA-5										
44	291231Z	23.5N 126.7E	SAT	(IR DATA)						PCN 1 NOAA-5										
45	291430Z	23.6N 126.1E	P	3 3	700	360	100	280	18	-	-	-	940	257	19 15	ELIP	E-W	7X 5		4
46	291555Z	23.2N 126.2E	SAT	(IR DATA)						PCN 1 DMSP										
47	291555Z	23.0N 126.1E	SAT	(IR DATA)						PCN 4 DMSP										
48	292043Z	23.3N 125.7E	P	2 5	700	-	-	-	-	-	-	-	932	247	17 14	ELIP	SE-NW	15X12		5
49	292236Z	23.4N 125.6E	SAT	(T5.0/5.0 /D1.5/24HRS)						PCN 1 DMSP										
50	292236Z	23.5N 125.5E	SAT	(T5.5/5.5 /D1.0/20HRS)						PCN 1 DMSP										
51	29233[illegible]Z	23.3N 125.9E	SAT	(IR DATA)						PCN 1 DMSP										
52	300058Z	23.8N 126.0E	SAT	(T5.0/5.0 /D1.5/25HRS)						NOAA-5			(CONF 01)							
53	300107Z	23.3N 125.6E	SAT	(T5.5/5.5 / D2.0/28 HRS)						PCN 1 DMSP										
54	300237Z	23.3N 125.5E	P	2 5	700	-	-	-	-	-	-	-	925	249	18 12	ELIP	SW-NE	15X12		5
55	300256Z	23.3N 125.6E	SAT	(IR DATA)						PCN 1 DMSP										
56	300256Z	23.2N 125.5E	SAT	(IR DATA)						PCN 1 DMSP										
57	300847Z	23.6N 125.2E	P	2 4	700	240	100	170	12	65	160	32	933	250	17 13	CIRC		8		6
58	301037Z	23.7N 124.9E	SAT	(IR DATA)						PCN 4 DMSP										
59	301037Z	23.7N 125.4E	SAT	(IR DATA)						PCN 6 DMSP										
60	301117Z	23.8N 124.9E	SAT	(IR DATA)						PCN 2 DMSP										
61	301117Z	23.5N 124.8E	SAT	(IR DATA)						PCN 2 DMSP										
62	301147Z	23.4N 124.9E	SAT	(IR DATA)						PCN 1 NOAA-5										
63	301154Z	22.9N 125.1E	SAT	(IR DATA)						NOAA-5			(CONF 02)							
64	301200Z	23.7N 125.0E	LRDR	- 10312												-	- -	-	24.3N 124.2E	-
65	301219Z	23.6N 124.7E	SAT	(IR DATA)						PCN 6 DMSP										
66	301218Z	23.6N 124.6E	SAT	(IR DATA)						PCN 4 DMSP										
67	301240Z	23.7N 124.8E	SAT	(IR DATA)						PCN 4 NOAA-4										
68	301300Z	23.8N 124.9E	LRDR	- 10423												-	- -	-	24.0N 121.6E	-
69	301300Z	23.7N 124.9E	LRDR	- 11412												-	- -	-	24.3N 124.2E	-
70	301400Z	23.8N 124.8E	LRDR	- 10413												-	- -	-	24.0N 121.6E	-
71	301400Z	23.8N 124.8E	LRDR	- 11311												-	- -	-	24.3N 124.2E	-
72	301400Z	23.8N 124.8E	LRDR	- 11311												-	- -	-	24.8N 125.3E	-
73	301500Z	23.9N 124.6E	LRDR	- 10472												-	- -	-	24.0N 121.6E	-
74	301500Z	23.8N 124.6E	LRDR	- 11411												-	- -	-	24.3N 124.2E	-
75	301500Z	23.9N 124.6E	LRDR	- 11411												-	- -	-	24.8N 125.3E	-
76	301538Z	24.0N 124.2E	SAT	(IR DATA)						PCN 1 DMSP										
77	301538Z	24.1N 124.1E	SAT	(IR DATA)						PCN 1 DMSP										
78	301600Z	24.0N 124.5E	LRDR	- 10742												-	- -	-	24.0N 121.6E	-
79	301600Z	23.9N 124.5E	LRDR	- 12411												-	- -	-	24.3N 124.2E	-
80	301600Z	23.9N 124.5E	LRDR	- 10313												-	- -	-	24.8N 125.3E	-
81	301700Z	24.0N 124.4E	LRDR	- 10791												-	- -	-	24.0N 121.6E	-
82	301700Z	23.9N 124.3E	LRDR	- 22631												-	- -	-	24.3N 124.2E	-
83	301700Z	23.9N 124.3E	LRDR	- 11563												-	- -	-	24.8N 125.3E	-
84	301800Z	24.1N 124.2E	LRDR	- 10582												-	- -	-	24.0N 121.6E	-
85	301800Z	24.0N 124.3E	LRDR	- 12511												-	- -	-	24.3N 124.2E	-
86	301800Z	24.0N 124.3E	LRDR	- 11733												-	- -	-	24.8N 125.3E	-
87	301900Z	24.1N 124.2E	LRDR	- 11472												-	- -	-	24.0N 121.6E	-
88	301900Z	24.0N 124.1E	LRDR	- 10511												-	- -	-	24.3N 124.2E	-
89	301900Z	24.0N 124.2E	LRDR	- 11713												-	- -	-	24.8N 125.3E	-
90	302000Z	24.2N 124.2E	LRDR	- 10572												-	- -	-	24.0N 121.6E	-

91	302000Z	24.1N	124.1E	LRUR	- 11631				-	- -	-	24.3N 124.2E	-
92	302000Z	24.1N	124.2E	LRUR	- 11613				-	- -	-	24.8N 125.3E	-
93	302100Z	24.3N	124.1E	LRUR	- 10575				-	- -	-	24.0N 121.6E	-
94	302100Z	24.2N	124.1E	LRUR	- 10511				-	- -	-	24.3N 124.2E	-
95	302100Z	24.1N	124.0E	LRUR	- 11613				-	- -	-	24.8N 125.3E	-
96	302142Z	24.2N	124.0E	P	3 5 700 200 105 160 20 - - - 926 245 20 12				CIRC		15		
97	302200Z	24.4N	124.0E	LRUR	- 10382				-	- -	-	24.0N 121.6E	-
98	302200Z	24.3N	124.0E	LRUR	- 12511				-	- -	-	24.3N 124.2E	-
99	302200Z	24.3N	124.0E	LRUR	- 10511				-	- -	-	24.8N 125.3E	-
100	302219Z	24.2N	124.0E	SAT	(T6.5/6.5 -/D1.0 /21HRS)	PCN 1	UMSP						
101	302219Z	24.3N	123.9E	SAT	(T6.0/6.0-/D1.0/24HRS)	PCN 1	UMSP						
102	302300Z	24.4N	123.8E	LRUR	- 10492				-	- -	-	24.0N 121.6E	-
103	302300Z	24.4N	123.8E	LRUR	- 10512				-	- -	-	24.3N 124.2E	-
104	302300Z	24.3N	123.8E	LRUR	- 10612				-	- -	-	24.8N 125.3E	-
105	302322Z	24.1N	123.6E	SAT	(IR DATA)	PCN 1	UMSP						
106	310000Z	24.4N	123.7E	LRUR	- 10512				-	- -	-	24.3N 124.2E	-
107	310000Z	24.4N	123.8E	LRUR	- 10512				-	- -	-	24.8N 125.3E	-
108	310015Z	24.8N	123.9E	SAT	(T6.0/6.0 /D1.0/23HRS)		NOAA-5	(CONF 01)					
109	310023Z	24.5N	123.7E	SAT	(IR DATA)	PCN 1	NOAA-5						
110	310100Z	24.5N	123.6E	LRUR	- 12512				-	- -	-	24.3N 124.2E	-
111	310100Z	24.5N	123.6E	LRUR	- 10513				-	- -	-	24.8N 125.3E	-
112	310140Z	24.5N	123.7E	LRUR	- 11533				-	- -	-	24.0N 121.6E	-
113	310200Z	24.6N	123.5E	LRUR	- 11512				-	- -	-	24.0N 121.6E	-
114	310200Z	24.6N	123.5E	LRUR	- 10413				-	- -	-	24.3N 124.2E	-
115	310200Z	24.6N	123.5E	LRUR	- 11513				-	- -	-	24.8N 125.3E	-
116	310238Z	24.8N	123.4E	SAT	(T6.5/6.5 /D1.0/28HRS)	PCN 1	UMSP						
117	310239Z	24.8N	123.5E	SAT	(IR DATA)	PCN 1	UMSP						
118	310300Z	24.8N	123.3E	LRUR	- 11513				-	- -	-	24.0N 121.6E	-
119	310300Z	24.7N	123.3E	LRUR	- 11511				-	- -	-	24.3N 124.2E	-
120	310300Z	24.7N	123.4E	LRUR	- 10533				-	- -	-	24.8N 125.3E	-
121	310400Z	24.8N	123.1E	LRUR	- 10511				-	- -	-	24.3N 124.2E	-
122	310400Z	24.8N	123.1E	LRUR	- 10512				-	- -	-	24.8N 125.3E	-
123	310500Z	24.9N	122.9E	LRUR	- 11573				-	- -	-	24.0N 121.6E	-
124	310500Z	24.9N	122.9E	LRUR	- 11512				-	- -	-	24.3N 124.2E	-
125	310500Z	24.8N	122.9E	LRUR	- 10512				-	- -	-	24.8N 125.3E	-
126	310600Z	25.0N	122.8E	LRUR	- 10512				-	- -	-	24.3N 124.2E	-
127	310600Z	24.9N	122.7E	LRUR	- 11634				-	- -	-	24.8N 125.3E	-
128	310700Z	25.1N	122.6E	LRUR	- 10482				-	- -	-	24.0N 121.6E	-
129	310700Z	25.0N	122.5E	LRUR	- 12612				-	- -	-	24.3N 124.2E	-
130	310700Z	25.0N	122.5E	LRUR	- 12634				-	- -	-	24.8N 125.3E	-
131	310800Z	25.2N	122.3E	LRUR	- 10412				-	- -	-	24.0N 121.6E	-
132	310800Z	25.2N	122.3E	LRUR	- 25142				-	- -	-	24.3N 124.2E	-
133	310800Z	25.1N	122.2E	LRUR	- 20643				-	- -	-	24.8N 125.3E	-
134	310820Z	25.2N	122.0E	LRUR	- 25761				-	- -	-	24.0N 121.6E	-
135	310850Z	25.2N	121.9E	P	3 3 700 150 78 60 15 - - - 931 249 20 15				ELIP	E-W	12X10		H
136	310900Z	25.0N	122.0E	LRUR	- 7///5				-	- -	-	24.8N 125.3E	-
137	311000Z	25.2N	121.6E	LRUR	- 20711				-	- -	-	24.3N 124.2E	-
138	311100Z	25.2N	121.3E	SAT	(IR DATA)	PCN 2	UMSP						
139	311100Z	25.0N	121.5E	SAT	(IR DATA)	PCN 1	UMSP						
140	311100Z	25.3N	121.4E	LRUR	- 55///				-	- -	-	24.3N 124.2E	-
141	311200Z	25.3N	121.6E	LRUR	- 5////				-	- -	-	22.6N 120.3E	-
142	311206Z	25.1N	122.2E	SAT	(IR DATA)	PCN 2	UMSP						
143	311207Z	24.9N	121.1E	SAT	(IR DATA)	PCN 1	UMSP						
144	311207Z	24.8N	121.6E	SAT	(IR DATA)	PCN 1	UMSP						
145	311259Z	24.4N	121.5E	SAT	(IR DATA)	PCN 4	NOAA-5						
146	311307Z	24.0N	121.0E	SAT	(IR DATA)		NOAA-5	(CONF 02)					
147	311400Z	25.1N	121.0E	LRUR	- 5////				-	- -	-	22.6N 120.3E	-
148	311500Z	24.8N	120.7E	LRUR	- 4////				-	- -	-	22.6N 120.3E	-
149	311520Z	25.3N	120.4E	SAT	(IR DATA)	PCN 3	UMSP						
150	311520Z	25.3N	120.7E	SAT	(IR DATA)	PCN 3	UMSP						
151	311700Z	24.8N	120.4E	LRUR	- 2081/				-	- -	-	22.6N 120.3E	-
152	312201Z	24.9N	119.5E	SAT	(T4.0/5.0-/W2.5/24HRS)	PCN 1	UMSP						
153	312201Z	25.0N	119.5E	SAT	(T4.5/5.5-/W1.5/24HRS)	PCN 1	UMSP						
154	010100Z	24.9N	119.1E	LRUR	- 11412				-	- -	-	22.6N 120.3E	-
155	010126Z	24.8N	119.1E	SAT	(T5.0/5.5 /W1.0/25HRS)		NOAA-5	(CONF 01)					
156	010136Z	25.1N	119.0E	SAT	(IR DATA)	PCN 3	NOAA-5						
157	010200Z	25.0N	118.5E	LRUR	- 50///				-	- -	-		-
158	011043Z	25.0N	116.3E	SAT	(IR DATA)	PCN 6	UMSP						
159	011223Z	23.6N	115.8E	SAT	(IR DATA)		NOAA-5	(CONF 01)					
160	020052Z	25.2N	113.0E	SAT	(IR DATA)	PCN 5	NOAA-5						

TROPICAL STORM WANDA
FIX POSITIONS FOR CYCLONE NO. 8
0600Z 31 JUL TO 0600Z 04 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIENTATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	291414Z	19.9N 140.3E	SAT	(IR DATA)						PCN 5 DMSP										
2	292311Z	23.0N 139.5E	SAT	(T 0/ 0 / / HRS)						PCN 5 NOAA-5										
3	300936Z	22.6N 139.5E	SAT	(IR DATA)						PCN 6 DMSP										
4	310014Z	23.7N 141.0E	SAT	(T1.5/1.5 / / HRS)						NOAA 5		(CONF 02)								
5	310023Z	23.0N 141.0E	SAT	(T2.0/2.0 /D2.0/25HRS)						PCN 5 NOAA-5										
6	310239Z	23.2N 140.3E	SAT	(IR DATA)						PCN 5 DMSP										
7	310918Z	23.7N 140.5E	SAT	(IR DATA)						PCN 6 DMSP										
8	310919Z	25.8N 140.3E	SAT							PCN 6 DMSP										
9	3111[illegible]3Z	24.1N 141.5E	SAT	(IR DATA)						PCN 5 NOAA-5										
10	311103Z	23.6N 140.0E	SAT	(IR DATA)						PCN 6 NOAA-5										
11	31111[illegible]Z	23.6N 141.5E	SAT	(IR DATA)						NOAA-5		(CONF 02)								
12	311339Z	25.0N 141.9E	SAT	(IR DATA)						PCN 6 DMSP										
13	31133[illegible]Z	26.3N 142.3E	SAT	(IR DATA)						PCN 6 DMSP										
14	312020Z	24.8N 141.0E	SAT	(IR DATA)						PCN 6 DMSP										
15	312326Z	24.5N 140.3E	P	5 15	700	-	-	-	-	45	40	90	996	305	13 -	CIRC		15		1
16	31233[illegible]Z	26.4N 141.4E	SAT	(T2.5/2.5 /D1.0/23HRS)						NOAA-5		(CONF 01)								
17	312339Z	25.2N 141.2E	SAT	(T3.0/3.0 /D1.0/23HRS)						PCN 5 NOAA-5										
18	010008Z	25.8N 140.5E	P	10 10	700	-	-	-	-	45	50	80	994	304	13 -	CIRC		10		1
19	010302Z	26.0N 140.1E	P	5 10	700	80	43	360	65	25	270	40	993	303	13 13	CIRC		12		1
20	010901Z	25.1N 141.0E	SAT							PCN 6 DMSP										
21	010902Z	25.8N 141.6E	SAT	(IR DATA)						PCN 6 DMSP										
22	011013Z	25.9N 141.5E	SAT	(IR DATA)						PCN 6 DMSP										
23	011019Z	26.1N 142.0E	SAT	(IR DATA)						PCN 6 NOAA-5										
24	011043Z	26.5N 139.8E	SAT	(IR DATA)						PCN 6 DMSP										
25	011503Z	26.8N 141.8E	SAT	(IR DATA)						PCN 5 DMSP										
26	011503Z	26.7N 140.4E	SAT	(IR DATA)						PCN 4 DMSP										
27	011628Z	27.2N 141.1E	P	8 10	700	210	40	120	12	-	-	-	993	303	13 13	-	- -	-		2
28	012003Z	27.4N 140.7E	SAT	(IR DATA)						PCN 5 DMSP										
29	012043Z	27.6N 140.3E	P	2 5	700	160	20	60	25	30	60	25	992	301	14 13	-	- -	-		3
30	012144Z	27.8N 140.4E	SAT	(T3.0/3.0 / / HRS)						PCN 3 DMSP										
31	012144Z	27.8N 140.5E	SAT	(T3.0/3.0 / / HRS)						PCN 3 DMSP										
32	012245Z	27.2N 140.4E	SAT	(T2.5/2.5 /S /23HRS)						NOAA-5		(CONF 01)								
33	012255Z	27.8N 140.4E	SAT	(IR DATA)						PCN 3 NOAA-5										
34	020052Z	27.7N 140.4E	SAT	(IR DATA)						PCN 3 NOAA-5										
35	020203Z	27.5N 140.5E	SAT	(IR DATA)						PCN 3 DMSP										
36	020203Z	27.6N 140.5E	SAT	(IR DATA)						PCN 3 DMSP										
37	020955Z	28.2N 142.4E	P	10 5	700	290	35	200	10	45	150	10	990	301	16 15	CIRC		12		4
38	021026Z	28.2N 142.5E	SAT	(IR DATA)						PCN 5 DMSP										
39	021026Z	28.4N 142.5E	SAT	(IR DATA)						PCN 3 DMSP										
40	021132Z	27.8N 142.2E	SAT	(IR DATA)						PCN 5 NOAA-5										
41	021132Z	28.2N 143.0E	SAT	(IR DATA)						PCN 6 NOAA-5										
42	021445Z	28.6N 142.7E	SAT	(IR DATA)						PCN 5 DMSP										
43	021445Z	28.3N 143.0E	SAT	(IR DATA)						PCN 4 DMSP										
44	022120Z	30.0N 143.5E	P	2 2	700	290	30	190	10	-	-	-	986	297	14 11	-	- -	-		5
45	022127Z	29.7N 143.4E	SAT	(T3.0/3.0 /S /24HRS)						PCN 5 DMSP										
46	022127Z	29.3N 143.4E	SAT	(T2.5/2.5 / / HRS)						PCN 3 DMSP										
47	022200Z	29.8N 143.7E	SAT	(T3.0/3.0 /D0.5/23HRS)						NOAA-5		(CONF 01)								
48	030008Z	30.0N 143.3E	SAT	(IR DATA)						PCN 3 NOAA-5										
49	030144Z	30.2N 143.5E	SAT	(IR DATA)						PCN 3 DMSP										
50	030146Z	30.3N 143.5E	SAT	(T2.5/3.0 /W0.5/28HRS)						PCN 3 DMSP										
51	031009Z	30.5N 143.9E	SAT	(IR DATA)						PCN 5 DMSP										
52	031009Z	30.8N 144.3E	SAT	(IR DATA)						PCN 6 DMSP										
53	031048Z	29.5N 143.4E	SAT	(IR DATA)						PCN 5 NOAA-5										
54	031056Z	29.4N 144.3E	SAT	(IR DATA)						NOAA-5		(CONF 02)								
55	031213Z	30.6N 145.8E	P	4 6	700	350	30	270	15	-	-	-	991	301	16 16	-	- -	-		6
56	031428Z	29.9N 145.3E	SAT	(IR DATA)						PCN 5 DMSP										
57	031428Z	30.0N 145.4E	SAT	(IR DATA)						PCN 6 DMSP										
58	032110Z	31.0N 146.1E	SAT	(T1.0/2.0 /W2.0/24HRS)						PCN 3 DMSP										
59	032110Z	31.0N 146.1E	SAT	(T1.0/2.0 /W1.5/20HRS)						PCN 3 DMSP										
60	032313Z	31.7N 146.5E	SAT	(T1.5/2.0 /W1.5/25HRS)						NOAA-5		(CONF 01)								
61	032324Z	31.1N 146.2E	SAT	(IR DATA)						PCN 3 NOAA-5										
62	040128Z	31.2N 146.5E	SAT	(IR DATA)						PCN 3 DMSP										
63	040128Z	31.0N 146.6E	SAT	(IR DATA)						PCN 3 DMSP										
64	040952Z	31.4N 146.9E	SAT	(IR DATA)						PCN 6 DMSP										
65	041014Z	32.0N 147.0E	SAT	(IR DATA)						NOAA-5		(CONF 02)								
66	042039Z	32.1N 148.1E	SAT	(T 0/1.5 /W1.0/24HRS)						PCN 3 DMSP										
67	042053Z	31.8N 148.3E	SAT	(IR DATA)						PCN 3 DMSP										
68	042229Z	32.2N 149.0E	SAT	(T1.0/1.5 /W0.5/23HRS)						NOAA-5		(CONF 01)								
69	042239Z	31.7N 148.5E	SAT	(IR DATA)						PCN 3 NOAA-5										
70	050034Z	31.6N 148.6E	SAT	(IR DATA)						PCN 3 NOAA-5										
71	050919Z	31.4N 148.8E	SAT	(IR DATA)						PCN 6 NOAA-5										
72	061032Z	34.2N 153.0E	SAT	(IR DATA)						PCN 6 NOAA-5										
73	052352Z	33.7N 150.4E	SAT	(T 0/ 0 /S /27HRS)						PCN 3 DMSP										

TROPICAL STORM AMY
FIX POSITIONS FOR CYCLONE NO. 9
0000Z 20 AUG TO 1800Z 23 AUG

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	172300Z	19.9N 128.4E	P	10 5	700	260	30	180	20	30	180	20	996	-	27 25	-	- -	-		1
2	180050Z	20.2N 127.7E	P	5 10	700	130	18	30	40	35	90	60	1001	302	13 14	-	- -	-		1
3	190151Z	21.0N 122.0E	SAT	(T1.5/1.5 / / HRS)							NOAA-5	(CONF 01)								
4	190250Z	22.0N 121.1E	SAT	(T1.5/1.5 / / HRS)						PCN 5	UMSP									
5	191040Z	20.9N 119.8E	SAT	(IR DATA)						PCN 6	UMSP									
6	191139Z	21.0N 119.5E	SAT	(IR DATA)						PCN 6	UMSP									
7	191239Z	20.6N 120.7E	SAT	(IR DATA)						PCN 5	NOAA-5									
8	192142Z	20.6N 121.0E	SAT	(T1.0/1.0 / / HRS)						PCN 5	UMSP									
9	192200Z	20.7N 120.9E	LRDR	- 40274												-	- -	-	22.6N 120.3E	-
10	192300Z	20.7N 120.8E	LRDR	- 45/5/												-	- -	-	22.6N 120.3E	-
11	200100Z	20.7N 120.6E	LRDR	- 1011/												-	- -	-	22.6N 120.3E	-
12	200107Z	21.5N 121.0E	SAT	(T1.5/1.5 /S /23 HRS)							NOAA-5	(CONF 02)								
13	200115Z	20.6N 120.6E	SAT	(IR DATA)						PCN 5	NOAA-5									
14	200200Z	20.7N 120.6E	LRDR	- 1022/												-	- -	-	22.6N 120.3E	-
15	200300Z	20.7N 120.6E	LRDR	- 25///												-	- -	-	22.6N 120.3E	-
16	200333Z	20.7N 120.0E	SAT	(T1.0/1.0 / / HRS)						PCN 6	UMSP									
17	200333Z	20.8N 119.9E	SAT	(T1.0/1.0 / / HRS)						PCN 5	UMSP									
18	200500Z	20.7N 120.5E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
19	200700Z	21.3N 120.5E	LRDR	- /////												-	- -	-	22.6N 120.3E	-
20	200900Z	21.3N 120.2E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
21	201000Z	21.3N 120.1E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
22	201024Z	20.0N 118.6E	SAT	(IR DATA)						PCN 6	UMSP									
23	201024Z	21.8N 119.3E	SAT	(IR DATA)						PCN 6	UMSP									
24	201030Z	21.2N 120.1E	P	2 2	1500	40	40	310	10	35	310	10	986	-	25 26	-	- -	-		2
25	201100Z	21.3N 119.9E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
26	201127Z	20.2N 118.7E	SAT	(IR DATA)						PCN 5	UMSP									
27	201155Z	21.0N 119.6E	SAT	(IR DATA)						PCN 5	NOAA-5									
28	201200Z	21.4N 119.8E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
29	201202Z	21.5N 119.0E	SAT								NOAA-5	(CONF 01)								
30	201205Z	21.0N 119.2E	SAT	(IR DATA)						PCN 6	UMSP									
31	201300Z	21.3N 119.3E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
32	201400Z	21.3N 119.0E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
33	201500Z	20.7N 119.0E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
34	201615Z	20.4N 118.6E	SAT	(IR DATA)						PCN 5	UMSP									
35	201615Z	20.0N 118.1E	SAT	(IR DATA)						PCN 5	UMSP									
36	202230Z	20.8N 117.7E	SAT	(IR DATA)						PCN 6	UMSP									
37	202300Z	20.3N 118.3E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
38	202306Z	20.7N 117.3E	SAT	(IR DATA)						PCN 5	UMSP									
39	202306Z	20.4N 117.8E	SAT	(IR DATA)						PCN 5	UMSP									
40	202306Z	19.0N 118.0E	SAT	(T2.5/2.5 /D1.0/20HRS)						PCN 4	UMSP									
41	210031Z	20.7N 117.9E	SAT	(T2.0/2.0 / / HRS)						PCN 5	NOAA-5									
42	210100Z	20.4N 118.3E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
43	210200Z	20.4N 118.3E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
44	210300Z	20.9N 119.0E	LRDR	- /////												-	- -	-	22.6N 120.3E	-
45	210315Z	20.7N 119.3E	SAT	(IR DATA)						PCN 5	UMSP									
46	210315Z	20.8N 119.2E	SAT	(T2.0/2.0 / / HRS)						PCN 3	UMSP									
47	210315Z	20.5N 119.3E	SAT	(T2.5/2.5-/D1.5/24HRS)						PCN 4	UMSP									
48	210315Z	20.3N 119.4E	SAT	(T1.0/1.0 /S /24HRS)						PCN 5	UMSP									
49	210315Z	21.0N 119.1E	SAT	(IR DATA)						PCN 3	UMSP									
50	211000Z	22.6N 119.4E	LRDR	- 10102												-	- -	-	22.6N 120.3E	-
51	211100Z	22.6N 119.1E	LRDR	- 1011/												-	- -	-	22.6N 120.3E	-
52	211111Z	21.8N 118.9E	SAT	(IR DATA)						PCN 5	NOAA-5									
53	211115Z	22.0N 118.9E	SAT	(IR DATA)						PCN 6	UMSP									
54	211115Z	22.5N 118.4E	SAT	(IR DATA)						PCN 4	UMSP									
55	211148Z	21.2N 119.1E	SAT	(IR DATA)						PCN 5	UMSP									
56	211148Z	22.4N 118.9E	SAT	(IR DATA)						PCN 5	UMSP									
57	211200Z	22.5N 118.9E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
58	211300Z	22.3N 118.7E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
59	211400Z	22.2N 118.6E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
60	211557Z	21.3N 118.8E	SAT	(IR DATA)						PCN 6	UMSP									
61	211557Z	22.3N 119.3E	SAT	(IR DATA)						PCN 5	UMSP									
62	211600Z	22.2N 118.8E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
63	211700Z	22.2N 118.8E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
64	211800Z	21.9N 118.9E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
65	212000Z	22.2N 119.5E	LRDR	- 4////												-	- -	-	22.6N 120.3E	-
66	212200Z	22.0N 119.5E	LRDR	- 1140/												-	- -	-	22.6N 120.3E	-
67	212218Z	23.2N 118.9E	SAT	(T2.0/2.0 / / HRS)						PCN 5	UMSP									
68	212244Z	22.1N 118.0E	SAT	(T2.0/2.5 /W0.5/24HRS)						PCN 4	UMSP									
69	212249Z	22.6N 119.6E	SAT	(T2.5/ 2.5-/ D1.5/ 24 HRS)						PCN 5	UMSP									
70	212249Z	23.0N 119.9E	SAT	(T2.0/2.0-/D1.0/20HRS)						PCN 5	UMSP									
71	220100Z	22.3N 120.0E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
72	220134Z	24.0N 120.1E	SAT	(T2.0/2.0 / / HRS)							NOAA-5	(CONF 01)								
73	220143Z	23.5N 120.2E	SAT	(IR DATA)						PCN 4	NOAA-5									
74	220200Z	22.4N 120.3E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
75	220258Z	23.7N 119.8E	SAT	(IR DATA)						PCN 3	UMSP									
76	220258Z	23.9N 119.6E	SAT	(T2.5/2.5-/D0.5/24HRS)						PCN 3	UMSP									
77	220300Z	22.3N 120.3E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
78	220500Z	22.1N 120.2E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
79	220600Z	22.1N 120.3E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
80	220700Z	23.5N 119.8E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
81	221100Z	24.2N 121.1E	LRDR	- /////												-	- -	-	22.6N 120.3E	-
82	221103Z	24.5N 120.3E	SAT	(IR DATA)						PCN 5	DMSP									
83	221103Z	25.5N 120.1E	SAT	(IR DATA)						PCN 6	UMSP									
84	221131Z	25.0N 120.6E	SAT	(IR DATA)						PCN 6	UMSP									
85	221131Z	23.9N 119.5E	SAT	(IR DATA)						PCN 5	UMSP									
86	221200Z	24.7N 121.1E	LRDR	- 1////												-	- -	-	22.6N 120.3E	-
87	221223Z	24.7N 120.6E	SAT	(IR DATA)						PCN 5	NOAA-5									
88	221231Z	24.6N 119.9E	SAT	(IR DATA)							NOAA-5	(CONF 01)								
89	221540Z	25.3N 121.1E	SAT	(IR DATA)						PCN 5	UMSP									
90	221540Z	25.0N 121.3E	SAT	(IR DATA)						PCN 5	UMSP									

91	222206Z	28.6N 123.9E	SAT	(IR DATA)					PCN 6	UMSP										
92	222231Z	29.5N 125.0E	SAT	(T2.0/2.0-/S /24HRS)					PCN 5	UMSP										
93	222232Z	28.5N 124.3E	SAT	(IR DATA)					PCN 6	UMSP										
94	222300Z	26.3N 123.8E	LRDR	- 5////												-	- -	-	22.6N 120.3E	-
95	230000Z	26.4N 124.0E	LRDR	- 20212												-	- -	-	22.6N 120.3E	-
96	230049Z	27.6N 123.4E	SAT	(T2.0/2.0 /S /23HRS)						NOAA-5		(CONF 01)								
97	230059Z	30.4N 125.5E	SAT	(T2.0/2.0 /S /27HRS)					PCN 5	NOAA-5										
98	230200Z	26.6N 124.9E	LRDR	- 201/1												-	- -	-	22.6N 120.3E	-
99	230240Z	30.3N 126.8E	SAT	(IR DATA)					PCN 6	UMSP										
100	230240Z	31.0N 124.4E	SAT	(T2.0/2.5 /W0.5/24HRS)					PCN 5	UMSP										
101	231050Z	31.2N 127.7E	SAT	T3.0/3.0-/D1.0/10 HRS					PCN 6	UMSP										
102	231114Z	32.3N 128.1E	SAT	(IR DATA)					PCN 5	UMSP										
103	231114Z	32.5N 129.0E	SAT	(IR DATA)					PCN 6	UMSP										
104	231139Z	31.5N 127.1E	SAT	(IR DATA)					PCN 5	NOAA-5										
105	231149Z	31.8N 127.5E	SAT	(IR DATA)						NOAA-5		(CONF 02)								
106	231522Z	31.8N 128.2E	SAT	(IR DATA)					PCN 5	UMSP										
107	231522Z	33.6N 130.0E	SAT	(IR DATA)					PCN 6	UMSP										
108	231522Z	32.8N 127.5E	SAT	(IR DATA)					PCN 4	UMSP										
109	240015Z	31.1N 129.9E	SAT	(T3.5/3.5 /D1.5/23HRS)					PCN 3	NOAA-5										
110	241108Z	38.0N 126.4E	SAT	(IR DATA)						NOAA-5		(CONF 01)								

TYPHOON BABE
FIX POSITIONS FOR CYCLONE NO. 10
0000Z 02 SEP TO 1800Z 10 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	301024Z	3.9N 158.0E	SAT	(IR DATA)					PCN 6	NOAA-5										
2	302015Z	5.7N 154.1E	SAT	(T1.0/1.0 / / HRS)					PCN 6	UMSP										
3	310201Z	6.2N 153.3E	SAT	(IR DATA)					PCN 6	UMSP										
4	310857Z	7.9N 153.0E	SAT	(IR DATA)					PCN 5	UMSP										
5	310910Z	8.0N 153.0E	SAT	(IR DATA)					PCN 6	NOAA-5										
6	311301Z	6.7N 152.4E	SAT	(IR DATA)					PCN 6	UMSP										
7	311958Z	6.7N 149.9E	SAT	(T1.0/1.0 /S /24HRS)					PCN 3	UMSP										
8	312216Z	7.1N 150.0E	SAT	(IR DATA)					PCN 4	NOAA-5										
9	010143Z	8.2N 149.1E	SAT	(IR DATA)					PCN 3	UMSP										
10	010840Z	8.1N 147.5E	SAT	(IR DATA)					PCN 6	UMSP										
11	010901Z	8.3N 147.5E	SAT	(IR DATA)					PCN 6	UMSP										
12	011052Z	8.9N 147.8E	SAT	(IR DATA)					PCN 6	NOAA-5										
13	011425Z	9.7N 146.8E	SAT	(IR DATA)					PCN 5	UMSP										
14	011425Z	8.1N 146.4E	SAT						PCN 6	UMSP										
15	012123Z	9.3N 144.8E	SAT	(T2.0/2.0 /D1.0/26HRS)					PCN 6	UMSP										
16	012123Z	9.1N 145.1E	SAT	(T2.0/2.0 / / HRS)					PCN 6	UMSP										
17	012146Z	9.1N 145.0E	SAT	(IR DATA)					PCN 6	UMSP										
18	012325Z	8.7N 144.4E	SAT	(T1.5/1.5 / / HRS)						NOAA-5		(CONF 02)								
19	012329Z	9.1N 144.6E	SAT	(IR DATA)					PCN 5	NOAA-5										
20	020052Z	8.1N 144.3E	P	5 2	1500	130	46	100	20	40	90	20	995	-	26 24	-	- -	-		1
21	020125Z	9.6N 143.3E	SAT	(IR DATA)					PCN 5	UMSP										
22	020334Z	8.3N 143.6E	P	5 1	1500	190	48	110	15	55	110	15	990	-	26 23	CIRC		6		2
23	021005Z	8.9N 142.6E	SAT	(IR DATA)					PCN 6	UMSP										
24	021005Z	9.4N 142.5E	SAT	(IR DATA)					PCN 6	UMSP										
25	021008Z	8.9N 142.3E	SAT	(IR DATA)					PCN 6	NOAA-5										
26	021031Z	9.0N 142.4E	SAT	(IR DATA)					PCN 6	UMSP										
27	021031Z	8.7N 141.7E	SAT	(IR DATA)					PCN 6	UMSP										
28	021407Z	9.4N 141.7E	SAT	(IR DATA)					PCN 5	UMSP										
29	021407Z	9.3N 141.7E	SAT	(IR DATA)					PCN 6	UMSP										
30	021555Z	8.9N 140.3E	P	10 -	700	140	55	50	20	-	-	-	-	-	- 12	-	- -	-		3
31	022106Z	9.9N 139.2E	SAT	(T3.0/3.0 /D1.0/24HRS)					PCN 5	UMSP										
32	022106Z	9.6N 139.8E	SAT	(T3.0/3.0 /D1.0/24HRS)					PCN 5	UMSP										
33	022133Z	9.8N 139.1E	SAT	(IR DATA)					PCN 5	UMSP										
34	022134Z	9.6N 139.7E	SAT	(IR DATA)					PCN 6	UMSP										
35	022245Z	9.9N 139.1E	SAT	(IR DATA)					PCN 6	NOAA-5										
36	030010Z	9.5N 137.5E	SAT	(T3.0/3.0 /D1.5/25HRS)						NOAA-5		(CONF 01)								
37	030330Z	10.0N 138.1E	P	5 2	700	30	55	270	40	50	90	10	993	308	4 13	-	- -	-		4
38	030833Z	10.4N 137.2E	P	10 1	700	130	55	40	35	50	40	20	992	301	4 12	-	- -	-		4
39	030948Z	10.2N 136.9E	SAT	(IR DATA)					PCN 5	UMSP										
40	030948Z	10.1N 136.3E	SAT	(IR DATA)					PCN 6	UMSP										
41	031017Z	10.3N 136.8E	SAT	(IR DATA)					PCN 6	UMSP										
42	031018Z	11.0N 136.9E	SAT	(IR DATA)					PCN 6	UMSP										
43	031121Z	10.9N 136.3E	SAT	(IR DATA)					PCN 5	NOAA-5										
44	031350Z	11.3N 136.3E	SAT	(IR DATA)					PCN 5	UMSP										
45	032127Z	11.5N 134.9E	SAT	(IR DATA)					PCN 5	UMSP										
46	032230Z	10.5N 134.6E	SAT	(T4.0/4.0 /D1.0/25HRS)					PCN 5	UMSP										
47	032230Z	11.3N 133.8E	SAT	(T4.0/4.0 /D1.0/25HRS)					PCN 6	UMSP										
48	032230Z	10.8N 134.6E	SAT	(T3.0/3.0 / / HRS)					PCN 5	UMSP										
49	032304Z	10.5N 134.5E	SAT	(IR DATA)					PCN 5	UMSP										
50	032326Z	10.0N 134.0E	SAT	(T4.0/4.0 /D1.0/23HRS)						NOAA-5		(CONF 01)								

51	032356Z	10.7N	134.5E	SAT	(IR DATA)	PCN 5	NOAA-5								
52	040232Z	10.9N	134.0E	SAT	(IR DATA)	PCN 5	UMSP								
53	040232Z	11.3N	133.4E	SAT	(IR DATA)	PCN 5	UMSP								
54	040232Z	10.7N	134.2E	SAT	(T3.5/3.5 / / HRS)	PCN 3	UMSP								
55	040309Z	10.7N	134.3E	P	6 2 700 120 61 360	38 95 120		20	987	296	17 13	-	--	-	5
56	040931Z	10.6N	132.8E	SAT	(IR DATA)	PCN 5	UMSP								
57	040931Z	10.8N	132.8E	SAT	(IR DATA)	PCN 6	UMSP								
58	041006Z	10.7N	132.6E	SAT	(IR DATA)	PCN 6	UMSP								
59	041037Z	10.6N	132.5E	SAT	(IR DATA)	PCN 6	NOAA-5								
60	041233Z	10.5N	132.0E	SAT	(IR DATA)	PCN 6	NOAA-5								
61	041513Z	10.5N	132.2E	SAT	(IR DATA)	PCN 5	UMSP								
62	041514Z	10.4N	131.4E	SAT	(IR DATA)	PCN 5	UMSP								
63	041514Z	10.8N	131.8E	SAT	(IR DATA)	PCN 6	UMSP								
64	042150Z	11.1N	131.9E	P	5 5 700 20 55 290	18 80 60		12	984	291	19 16	-	--	-	6
65	042213Z	10.4N	131.4E	SAT	(T5.0/5.0 /D1.0/24HRS)	PCN 5	UMSP								
66	042213Z	10.4N	131.3E	SAT	(T5.0/5.0 /D1.0/24HRS)	PCN 6	UMSP								
67	042213Z	10.5N	131.8E	SAT	(T4.0/4.0 /D0.5/21HRS)	PCN 3	UMSP								
68	042251Z	10.4N	131.5E	SAT	(IR DATA)	PCN 5	UMSP								
69	042251Z	10.4N	131.1E	SAT	(IR DATA)	PCN 6	UMSP								
70	042313Z	10.2N	131.3E	SAT	(IR DATA)	PCN 6	NOAA-5								
71	050038Z	10.5N	132.0E	SAT	(T4.0/4.0 /S /25HRS)		NOAA-5	(CONF 01)							
72	050214Z	10.3N	130.9E	SAT	(IR DATA)	PCN 5	UMSP								
73	050214Z	10.4N	130.7E	SAT	(IR DATA)	PCN 5	UMSP								
74	050832Z	11.1N	130.9E	P	5 2 700 210 65 150	50 65 150		50	988	290	17 13	-	--	-	7
75	051055Z	10.7N	130.8E	SAT	(IR DATA)	PCN 5	UMSP								
76	051055Z	10.4N	130.1E	SAT	(IR DATA)	PCN 6	UMSP								
77	051136Z	10.8N	130.6E	SAT	(IR DATA)	PCN 5	UMSP								
78	051149Z	11.1N	130.5E	SAT	(IR DATA)	PCN 5	NOAA-5								
79	051152Z	10.8N	130.9E	SAT	(IR DATA)		NOAA-5	(CONF 03)							
80	051456Z	11.2N	130.3E	SAT	(IR DATA)	PCN 5	UMSP								
81	051456Z	10.6N	130.3E	SAT	(IR DATA)	PCN 6	UMSP								
82	052155Z	12.1N	130.5E	SAT	(T4.5/4.5 / / HRS)	PCN 5	UMSP								
83	052156Z	12.0N	129.6E	SAT	(T5.0/5.0 /S /24HRS)	PCN 5	UMSP								
84	052239Z	13.0N	130.7E	SAT	(IR DATA)	PCN 5	UMSP								
85	052239Z	12.3N	130.2E	SAT	(IR DATA)	PCN 5	UMSP								
86	052243Z	13.1N	130.2E	P	2 5 700 340 45 240	50 70 240		30	982	293	17 13	-	--	-	8
87	060025Z	13.3N	130.2E	SAT	(IR DATA)	PCN 5	NOAA-5								
88	060157Z	13.3N	130.2E	SAT	(IR DATA)	PCN 5	UMSP								
89	060157Z	13.2N	130.2E	SAT	(T5.0/5.0 /S /27HRS)	PCN 4	UMSP								
90	060335Z	13.7N	129.9E	P	2 5 700 230 55 140	40 80 150		80	980	291	16 11	-	--	-	8
91	061038Z	14.8N	129.4E	SAT	(IR DATA)	PCN 5	UMSP								
92	061038Z	15.1N	129.9E	SAT	(IR DATA)	PCN 5	UMSP								
93	061038Z	14.0N	129.7E	SAT	(IR DATA)	PCN 4	UMSP								
94	061105Z	14.9N	129.0E	SAT	(IR DATA)	PCN 6	NOAA-5								
95	061124Z	15.0N	128.9E	SAT	(IR DATA)	PCN 5	UMSP								
96	061124Z	15.0N	129.3E	SAT	(IR DATA)	PCN 6	UMSP								
97	061439Z	15.6N	129.0E	SAT	(IR DATA)	PCN 5	UMSP								
98	061439Z	15.4N	129.4E	SAT	(IR DATA)	PCN 2	UMSP								
99	062138Z	16.2N	128.6E	SAT	(T5.0/5.0 / / HRS)	PCN 2	UMSP								
100	062139Z	16.3N	128.6E	SAT	(IR DATA)	PCN 1	UMSP								
101	062139Z	16.3N	128.7E	SAT	(T5.5/5.5 /D0.5/24HRS)	PCN 1	UMSP								
102	062139Z	16.3N	129.0E	SAT	(T6.0/6.0 /D1.0/20HRS)	PCN 2	UMSP								
103	062220Z	16.2N	128.8E	P	5 5 700 360 57 270	20 - -		-	960	274	18 11	ELIP	N-S	20X15	9
104	062227Z	16.3N	128.6E	SAT	(IR DATA)	PCN 1	UMSP								
105	062227Z	16.4N	128.8E	SAT	(T5.5/5.5 /D1.0/24HRS)	PCN 3	UMSP								
106	062336Z	16.8N	128.9E	SAT	(T5.0/5.0 / / HRS)		NOAA-5	(CONF 01)							
107	062341Z	16.5N	128.6E	SAT	(IR DATA)	PCN 1	NOAA-5								
108	070320Z	17.4N	128.5E	SAT	(IR DATA)	PCN 1	UMSP								
109	070321Z	17.5N	128.6E	SAT	(IR DATA)	PCN 2	UMSP								
110	070321Z	17.1N	128.7E	SAT	(IR DATA)	PCN 2	UMSP								
111	070321Z	17.9N	128.5E	SAT	(IR DATA)	PCN 1	UMSP								
112	070344Z	17.3N	128.4E	P	3 1 700 80 95 350	30 80 350		10	947	262	21 12	CIRC		15	10
113	071021Z	18.2N	127.8E	SAT	(IR DATA)	PCN 1	UMSP								
114	071021Z	18.5N	127.9E	SAT	(IR DATA)	PCN 2	UMSP								
115	071021Z	18.2N	128.0E	SAT	(IR DATA)	PCN 2	UMSP								
116	071112Z	18.3N	128.0E	SAT	(IR DATA)	PCN 1	UMSP								
117	071112Z	18.1N	128.5E	SAT	(IR DATA)	PCN 1	UMSP								
118	071218Z	18.6N	128.0E	SAT	(IR DATA)	PCN 1	NOAA-5								
119	071220Z	18.0N	127.6E	SAT	(IR DATA)		NOAA-5	(CONF 01)							
120	071603Z	19.1N	127.5E	SAT	(IR DATA)	PCN 2	UMSP								
121	071603Z	18.8N	127.9E	SAT	(IR DATA)	PCN 1	UMSP								
122	072122Z	19.9N	126.9E	SAT	(T7.0/7.0 /D1.5/24HRS)	PCN 1	UMSP								
123	072122Z	19.9N	127.2E	SAT	(T6.5/6.5 /D0.5/24HRS)	PCN 2	UMSP								
124	072204Z	20.1N	127.4E	P	5 5 700 70 100 360	12 130 150		10	967	228	17 14	CIRC		10	11
125	072215Z	19.9N	126.9E	SAT	(IR DATA)	PCN 2	UMSP								
126	072215Z	19.7N	127.4E	SAT	(T6.0/6.0 /D0.5/24HRS)	PCN 2	UMSP								
127	080023Z	20.5N	127.0E	SAT	(T6.0/6.0 /D1.0/25HRS)		NOAA-5	(CONF 01)							
128	080054Z	20.6N	127.2E	SAT	(IR DATA)	PCN 1	NOAA-5								
129	080303Z	21.0N	127.0E	SAT	(IR DATA)	PCN 1	UMSP								
130	080303Z	21.0N	127.2E	SAT	(IR DATA)	PCN 3	UMSP								
131	080303Z	20.8N	127.3E	SAT	(IR DATA)	PCN 1	UMSP								
132	080303Z	21.1N	127.0E	SAT	(T6.5/6.5 / / HRS)	PCN 1	UMSP								
133	080349Z	21.0N	127.0E	P	3 5 700 320 95 260	20 140 240		8	966	227	21 15	CIRC		14	11
134	081004Z	21.7N	126.7E	SAT	(IR DATA)	PCN 1	UMSP								
135	081004Z	21.9N	126.5E	SAT	(IR DATA)	PCN 4	UMSP								
136	081004Z	22.0N	126.8E	SAT	(IR DATA)	PCN 2	UMSP								
137	081100Z	21.9N	126.8E	SAT	(IR DATA)	PCN 1	UMSP								
138	081100Z	22.4N	126.9E	SAT	(IR DATA)	PCN 4	UMSP								
139	081100Z	22.0N	126.6E	SAT	(IR DATA)	PCN 2	UMSP								
140	081134Z	22.0N	126.9E	SAT	(IR DATA)	PCN 1	NOAA-5								

141	081200Z	21.9N	126.9E	LRDR	- 25//3	-	-	-	-	24.8N 125.3E	-
142	081300Z	22.0N	127.0E	LRDR	- 6///3	-	-	-	-	24.8N 125.3E	-
143	081300Z	21.9N	126.9E	LRDR	- 25//3	-	-	-	-	24.3N 124.2E	-
144	081400Z	22.1N	127.0E	LRDR	- 6///3	-	-	-	-	24.8N 125.3E	-
145	081400Z	22.0N	127.0E	LRDR	- 25//3	-	-	-	-	24.3N 124.2E	-
146	081500Z	22.2N	127.0E	LRDR	- 25//4	-	-	-	-	24.3N 124.2E	-
147	081500Z	22.2N	127.0E	LRDR	- 6///3	-	-	-	-	24.8N 125.3E	-
148	081500Z	22.2N	127.1E	LRDR	- GOOD FIX 20D MOV 0410	-	-	-	-	24.8N 125.3E	-
149	081545Z	22.1N	127.5E	SAT	(IR DATA) PCN 3 DMSP						
150	081545Z	21.9N	126.7E	SAT	(IR DATA) PCN 2 DMSP						
151	081600Z	22.2N	127.2E	LRDR	- 6///4	-	-	-	-	24.3N 124.2E	-
152	081600Z	22.2N	127.0E	LRDR	- 25//4	-	-	-	-	24.8N 125.3E	-
153	081600Z	22.3N	127.2E	LRDR	- GOOD FIX 20D MOV 0410	-	-	-	-	24.8N 125.3E	-
154	081700Z	22.3N	127.2E	LRDR	- 6///4	-	-	-	-	24.3N 124.2E	-
155	081700Z	22.4N	127.2E	LRDR	- 25//4	-	-	-	-	24.8N 125.3E	-
156	081700Z	22.4N	127.3E	LRDR	- GOOD FIX 20D MOV 3610	-	-	-	-	24.8N 125.3E	-
157	081800Z	22.6N	127.3E	LRDR	- 25//4	-	-	-	-	24.8N 125.3E	-
158	081800Z	22.6N	127.4E	LRDR	- GOOD FIX 20D MOV 0410	-	-	-	-	24.8N 125.3E	-
159	081900Z	22.7N	127.4E	LRDR	- 12574	-	-	-	-	24.8N 125.3E	-
160	081900Z	22.7N	127.5E	LRDR	- GOOD FIX 20D MOV 0420	-	-	-	-	24.8N 125.3E	-
161	082000Z	22.8N	127.6E	LRDR	- 10414	-	-	-	-	24.8N 125.3E	-
162	082000Z	22.8N	127.7E	LRDR	- GOOD FIX MOV 0420	-	-	-	-	24.8N 125.3E	-
163	082100Z	23.1N	127.7E	LRDR	- 10371	-	-	-	-	26.2N 127.8E	-
164	082105Z	23.0N	128.1E	SAT	(IR DATA) PCN 3 DMSP						
165	082200Z	23.2N	127.8E	LRDR	- 20343	-	-	-	-	26.2N 127.8E	-
166	082203Z	23.1N	127.9E	SAT	(T6.0/7.0 /W1.0/25HRS) PCN 1 DMSP						
167	082246Z	23.4N	128.0E	SAT	(T7.0/7.0 / / HRS) PCN 1 DMSP						
168	082246Z	23.2N	128.2E	SAT	(T7.0/7.0 /D0.5/25HRS) PCN 4 DMSP						
169	082246Z	23.8N	127.9E	SAT	(T6.5/6.5 /S /22HRS) PCN 1 DMSP						
170	082246Z	23.3N	127.4E	SAT	(T5.0/6.0 /W1.0/24HRS) PCN 1 DMSP						
171	082250Z	23.4N	127.9E	P	5 5 700 240 90 180 15 110 180 14 916 236 18 15 CIRC				10		12
172	082300Z	23.4N	128.0E	LRDR	- 10343	-	-	-	-	26.2N 127.8E	-
173	090000Z	23.0N	128.0E	SAT	(T6.5/6.5 /D0.5/24HRS) NOAA-5 (CONF 01)						
174	090010Z	23.7N	128.0E	SAT	(IR DATA) PCN 1 NOAA-5						
175	090100Z	23.9N	128.1E	LRDR	- 25//3	-	-	-	-	24.8N 125.3E	-
176	090100Z	23.8N	128.1E	LRDR	- 13411	-	-	-	-	26.2N 127.8E	-
177	090200Z	24.2N	128.4E	LRDR	- 13411	-	-	-	-	26.2N 127.8E	-
178	090245Z	24.4N	128.1E	SAT	(IR DATA) PCN 1 DMSP						
179	090245Z	24.3N	128.3E	SAT	(IR DATA) PCN 3 DMSP						
180	090245Z	24.5N	128.0E	SAT	(IR DATA) PCN 1 DMSP						
181	090300Z	24.3N	128.4E	LRDR	- 6///3	-	-	-	-	26.2N 127.8E	-
182	090300Z	24.4N	128.2E	LRDR	- 13831	-	-	-	-	24.8N 125.3E	-
183	090345Z	24.4N	128.3E	P	2 5 700 10 70 300 40 100 360 10 920 239 17 15 CIRC				25		12
184	090400Z	24.5N	128.3E	LRDR	- 5///3	-	-	-	-	24.8N 125.3E	-
185	090400Z	24.6N	128.4E	LRDR	- 13511	-	-	-	-	26.2N 127.8E	-
186	090500Z	24.8N	128.5E	LRDR	- 10903	-	-	-	-	26.2N 127.8E	-
187	090500Z	24.7N	128.4E	LRDR	- 10831	-	-	-	-	24.8N 125.3E	-
188	090600Z	25.0N	128.6E	LRDR	- 10913	-	-	-	-	24.8N 125.3E	-
189	090600Z	25.1N	128.6E	LRDR	- 10811	-	-	-	-	26.2N 127.8E	-
190	090700Z	25.4N	128.8E	LRDR	- 5//43	-	-	-	-	26.2N 127.8E	-
191	090700Z	25.3N	128.8E	LRDR	- 10611	-	-	-	-	24.8N 125.3E	-
192	090700Z	25.3N	128.8E	LRDR	- 209/3	-	-	-	-	28.4N 129.5E	-
193	090700Z	25.4N	128.7E	LRDR	- POOR FIX SPRL CUF MOD ALL QUAD TOP 300 NWE	-	-	-	-	26.2N 127.7E	-
194	090800Z	25.6N	128.9E	LRDR	- 6///3	-	-	-	-	24.8N 125.3E	-
195	090800Z	25.7N	128.8E	LRDR	- 10730	-	-	-	-	26.2N 127.8E	-
196	090800Z	25.6N	128.9E	LRDR	- 10814	-	-	-	-	28.4N 129.5E	-
197	090800Z	25.5N	128.8E	LRDR	- SPRL CUF MOD ALL QUAD T350 MOV N	-	-	-	-	26.2N 127.7E	-
198	090805Z	25.7N	128.8E	LRDR	- GOOD FIX 90% WALL CLD CIRC 20	-	-	-	-	26.4N 127.8E	-
199	090900Z	25.9N	128.9E	LRDR	- 10621	-	-	-	-	28.4N 129.5E	-
200	090900Z	26.0N	128.8E	LRDR	- 10714	-	-	-	-	26.2N 127.8E	-
201	090905Z	26.0N	128.9E	LRDR	- GOOD FIX 90% WALL CLD CIRC D20	-	-	-	-	26.4N 127.8E	-
202	090910Z	26.0N	128.8E	LRDR	- POOR FIX SPRL CUF MOD ALL QUAD T 400 MOV N	-	-	-	-	26.2N 127.7E	-
203	090930Z	26.1N	128.8E	LRDR	- GOOD FIX 90% WALL CLD CIRC D-20 SPRL BAND AREA 7RWPS/NC 317/133 4/106	-	-	-	-	26.4N 127.8E	-
204	091000Z	26.2N	128.8E	LRDR	- 10711	-	-	-	-	28.4N 129.5E	-
205	091000Z	26.3N	128.8E	LRDR	- 10714	-	-	-	-	26.2N 127.8E	-
206	091005Z	26.4N	128.8E	LRDR	- GOOD FIX 70% WALL CLD CIRC 020	-	-	-	-	26.4N 127.8E	-
207	091010Z	26.3N	128.8E	LRDR	- POOR FIX SPRL CUF MOD ALL WUAD T 400 MOV N	-	-	-	-	26.2N 127.7E	-
208	091030Z	26.5N	128.8E	LRDR	- GOOD FIX 65% WALL CLD CIRC D20 SPRL BND AREA 7RWPS/NC 337/133 47/82	-	-	-	-	26.4N 127.8E	-
209	091047Z	26.4N	128.8E	SAT	(IR DATA) PCN 2 DMSP						
210	091047Z	26.5N	128.8E	SAT	(IR DATA) PCN 1 DMSP						
211	091047Z	26.7N	129.0E	SAT	(IR DATA) PCN 2 DMSP						
212	091050Z	26.3N	128.6E	SAT	(IR DATA) PCN 2 NOAA-5						
213	091100Z	26.5N	128.8E	LRDR	- 11711	-	-	-	-	26.2N 127.8E	-
214	091100Z	26.5N	128.8E	LRDR	- 10712	-	-	-	-	28.4N 129.5E	-
215	091107Z	26.5N	128.8E	LRDR	- POOR FIX SPRL CUF MOD ALL QUAD T 440 MOV N	-	-	-	-	26.2N 127.7E	-
216	091110Z	26.7N	128.7E	LRDR	- GOOD FIX 80 PCNT WALL CLD CIRC D20	-	-	-	-	26.4N 127.8E	-
217	091129Z	26.7N	128.8E	SAT	(IR DATA) PCN 1 DMSP						
218	091129Z	26.9N	128.7E	SAT	(IR DATA) PCN 1 DMSP						
219	091135Z	26.8N	128.8E	LRDR	- GOOD FIX 90% WALL CLD CIRC D20	-	-	-	-	26.4N 127.8E	-
220	091200Z	26.8N	128.8E	LRDR	- 10611	-	-	-	-	26.2N 127.8E	-
221	091200Z	26.9N	128.7E	LRDR	- 10712	-	-	-	-	28.4N 129.5E	-
222	091200Z	27.0N	128.7E	LRDR	- GOOD FIX 90% WALL CLD CIRC D20	-	-	-	-	26.4N 127.8E	-
223	091208Z	26.9N	128.4E	LRDR	- POOR FIX SPRL CUF MOD ALL QUAD T420 MOV N	-	-	-	-	26.2N 127.7E	-
224	091300Z	27.2N	128.7E	LRDR	- 10711	-	-	-	-	26.2N 127.8E	-
225	091300Z	27.2N	128.7E	LRDR	- 10612	-	-	-	-	28.4N 129.5E	-
226	091300Z	27.3N	128.5E	LRDR	- GOOD FIX 90% WALL CLD CIRC D16	-	-	-	-	26.4N 127.8E	-
227	091308Z	27.5N	128.6E	LRDR	- POOR FIX SPRL CUF MOD ALL QUAD T420 MOV N	-	-	-	-	26.2N 127.7E	-
228	091332Z	27.4N	128.5E	LRDR	- GOOD FIX 90% WALL CLD CIRC D20	-	-	-	-	26.4N 127.8E	-
229	091400Z	27.5N	128.6E	LRDR	- 11831	-	-	-	-	26.2N 127.8E	-
230	091400Z	27.5N	128.6E	LRDR	- 10712	-	-	-	-	28.4N 129.5E	-

231	091400Z	27.6N	128.4E	LRDR	-	GOOD FIX 80% WALL CLD CIRC D20														-	- -	-	26.4N 127.8E	-
232	091430Z	27.7N	128.4E	LRDR	-	GOOD FIX 75% WALL CLD CIRC D20														-	- -	-	26.4N 127.8E	-
233	091500Z	27.8N	128.5E	LRDR	-	10811														-	- -	-	26.2N 127.8E	-
234	091500Z	27.8N	128.5E	LRDR	-	10712														-	- -	-	28.[illegible]N 129.5E	-
235	091500Z	28.0N	128.3E	LRDR	-	GOOD FIX 70% WALL CLD CIRC D20														-	- -	-	26.4N 127.8E	-
236	091527Z	27.5N	128.6E	SAT	(IR DATA)	PCN 1	UMSP																	
237	091527Z	28.2N	128.4E	SAT	(IR DATA)	PCN 3	UMSP																	
238	091527Z	27.9N	128.5E	SAT	(IR DATA)	PCN 1	UMSP																	
239	091527Z	27.3N	128.2E	SAT	(IR DATA)	PCN 1	UMSP																	
240	091534Z	28.1N	128.3E	LRDR	-	GOOD FIX 70% WALL CLD CIRC D20														-	- -	-	26.4N 127.8E	-
241	091600Z	28.2N	128.3E	LRDR	-	10811														-	- -	-	26.2N 127.8E	-
242	091600Z	28.2N	128.4E	LRDR	-	10622														-	- -	-	28.4N 129.5E	-
243	091605Z	28.4N	128.1E	LRDR	-	GOOD FIX 60% WALL CLD CIRC D20														-	- -	-	26.4N 127.8E	-
244	091630Z	28.4N	128.1E	LRDR	-	POOR FIX 15% WALL CLD CIRC D19														-	- -	-	26.4N 127.8E	-
245	091650Z	28.0N	128.7E	P	5	5	700	260	95	180	15	-	-	-	916	235	25	13	CIRC			13		13
246	091700Z	28.6N	128.1E	LRDR	-	11811														-	- -	-	26.2N 127.8E	-
247	091700Z	28.7N	128.2E	LRDR	-	10632														-	- -	-	28.4N 129.5E	-
248	091800Z	29.1N	127.9E	LRDR	-	2194/														-	- -	-	26.2N 127.8E	-
249	091800Z	29.1N	127.9E	LRDR	-	10612														-	- -	-	28.4N 129.5E	-
250	091900Z	29.5N	127.5E	LRDR	-	3////														-	- -	-	26.2N 127.8E	-
251	091900Z	29.4N	127.6E	LRDR	-	20762														-	- -	-	28.4N 129.5E	-
252	092000Z	29.7N	127.1E	LRDR	-	31864														-	- -	-	28.4N 129.5E	-
253	092100Z	29.9N	126.8E	LRDR	-	20814														-	- -	-	28.4N 129.5E	-
254	092150Z	31.0N	126.9E	SAT	(IR DATA)	PCN 4	UMSP																	
255	092151Z	30.7N	126.8E	SAT	(T5.0/6.0 /W1.0/25HRS)	PCN 6	UMSP																	
256	092200Z	30.2N	126.2E	LRDR	-	35//5														-	- -	-	28.4N 129.5E	-
257	092220Z	30.2N	126.6E	P	10	10	700	180	123	150	15	130	310	10	938	255	26	15	CIRC			18		13
258	092229Z	30.3N	126.3E	SAT	(T5.0/6.0-/W2.0/24HRS)	PCN 5	UMSP																	
259	092229Z	30.9N	126.9E	SAT	(T5.5/6.5 /W1.5/24HRS)	PCN 5	UMSP																	
260	092229Z	30.3N	126.8E	SAT	(T5.5/6.5 /W1.0/24HRS)	PCN 3	UMSP																	
261	100111Z	30.0N	125.0E	SAT	(T6.5/6.5 /S /25HRS)		NOAA-5	(CONF 02)																
262	100122Z	31.2N	125.4E	SAT	(IR DATA)	PCN 5	NOAA-5																	
263	100228Z	30.7N	124.7E	SAT	(IR DATA)	PCN 5	UMSP																	
264	100228Z	30.8N	124.8E	SAT	(IR DATA)	PCN 3	UMSP																	
265	100228Z	30.9N	124.8E	SAT	(IR DATA)	PCN 3	UMSP																	
266	100405Z	30.5N	124.5E	P	-	-	700	-	90	-	-	80	-	-	-	-	-	-		-	- -	-		14
267	101035Z	31.0N	123.5E	SAT	(IR DATA)	PCN 5	UMSP																	
268	101112Z	31.1N	123.3E	SAT	(IR DATA)	PCN 3	UMSP																	
269	101112Z	31.2N	123.4E	SAT	(IR DATA)	PCN 3	UMSP																	
270	101112Z	31.2N	123.0E	SAT	(IR DATA)	PCN 1	UMSP																	
271	101112Z	31.0N	122.9E	SAT	(IR DATA)	PCN 4	UMSP																	
272	101202Z	31.0N	123.4E	SAT	(IR DATA)	PCN 3	NOAA-5																	
273	101212Z	31.1N	123.2E	SAT	(IR DATA)		NOAA-5	(CONF 01)																
274	101510Z	31.3N	122.9E	SAT	(IR DATA)	PCN 5	UMSP																	
275	101510Z	31.2N	122.6E	SAT	(IR DATA)	PCN 5	UMSP																	
276	102211Z	31.9N	121.7E	SAT	(IR DATA)	PCN 3	UMSP																	
277	102211Z	31.9N	121.9E	SAT	(IR DATA)	PCN 3	UMSP																	
278	102212Z	31.6N	121.6E	SAT	(IR DATA)	PCN 5	UMSP																	
279	110027Z	31.8N	121.8E	SAT	(T5.0/6.5 /W1.5/23HRS)		NOAA-5	(CONF 02)																
280	110038Z	31.9N	121.0E	SAT	(IR DATA)	PCN 5	NOAA-5																	
281	110210Z	32.1N	120.7E	SAT	(IR DATA)	PCN 3	UMSP																	
282	110210Z	31.8N	120.8E	SAT	(IR DATA)	PCN 3	UMSP																	
283	111054Z	31.7N	119.3E	SAT	(IR DATA)	PCN 3	UMSP																	
284	112155Z	31.1N	117.2E	SAT	(IR DATA)	PCN 5	UMSP																	
285	120151Z	30.9N	116.2E	SAT	(IR DATA)	PCN 5	NOAA-5																	
286	121230Z	30.0N	113.4E	SAT	(IR DATA)	PCN 6	NOAA-5																	
287	130107Z	29.7N	110.0E	SAT	(IR DATA)	PCN 5	NOAA-5																	

TROPICAL STORM CARLA
FIX POSITIONS FOR CYCLONE NO. 11
0000Z 03 SEP TO 0000Z 05 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	302156Z	13.6N 131.9E	SAT	(T1.0/1.0 / / HRS)						PCN 5 UMSP										
2	310056Z	13.7N 131.4E	SAT	(IR DATA)						PCN 6 NOAA-5										
3	310201Z	14.6N 129.6E	SAT	(IR DATA)						PCN 5 UMSP										
4	311039Z	14.8N 130.0E	SAT	(IR DATA)						PCN 5 UMSP										
5	311136Z	14.0N 129.6E	SAT	(IR DATA)						PCN 5 NOAA-5										
6	311442Z	15.0N 129.4E	SAT	(IR DATA)						PCN 5 UMSP										
7	312141Z	15.1N 128.7E	SAT	(T 0/0.5 /W1.0/24HRS)						PCN 5 UMSP										
8	010325Z	14.2N 126.6E	SAT	(T1.0/1.0 / / HRS)						PCN 5 UMSP										
9	011022Z	17.8N 122.9E	SAT	(IR DATA)						PCN 5 UMSP										
10	011043Z	14.5N 125.1E	SAT	(IR DATA)						PCN 5 UMSP										
11	011249Z	18.2N 122.7E	SAT	(IR DATA)						PCN 6 NOAA-5										
12	011607Z	16.5N 122.1E	SAT	(IR DATA)						PCN 6 UMSP										
13	011607Z	16.3N 121.9E	SAT	(IR DATA)						PCN 5 UMSP										
14	012304Z	18.3N 120.1E	SAT	(T2.0/2.0 / / HRS)						PCN 5 UMSP										
15	012304Z	17.5N 120.9E	SAT	(T2.0/2.0 /D1.0/20HRS)						PCN 5 UMSP										
16	012304Z	17.5N 121.0E	SAT	(T2.0/2.0 / / HRS)						PCN 3 UMSP										
17	012328Z	18.3N 119.9E	SAT	(IR DATA)						PCN 6 UMSP										
18	012328Z	17.6N 120.6E	SAT	(IR DATA)						PCN 5 UMSP										
19	020125Z	18.3N 119.6E	SAT	(T2.0/2.0 / / HRS)						PCN 5 NOAA-5										
20	021147Z	18.7N 116.1E	SAT	(IR DATA)						PCN 6 UMSP										
21	021147Z	17.9N 116.2E	SAT	(IR DATA)						PCN 6 UMSP										
22	021205Z	18.2N 116.4E	SAT	(IR DATA)						PCN 6 NOAA-5										
23	021213Z	18.8N 116.0E	SAT	(IR DATA)						PCN 6 UMSP										
24	021549Z	18.3N 114.6E	SAT	(IR DATA)						PCN 5 UMSP										
25	021549Z	18.2N 115.3E	SAT	(IR DATA)						PCN 5 UMSP										
26	022247Z	18.3N 112.6E	SAT	(T2.0/2.0 / / HRS)						PCN 5 UMSP										
27	022247Z	18.4N 113.7E	SAT	(IR DATA)						PCN 6 UMSP										
28	022247Z	19.5N 115.0E	SAT	(IR DATA)						PCN 5 UMSP										
29	022316Z	19.9N 114.9E	SAT	(IR DATA)						PCN 6 UMSP										
30	022316Z	18.4N 111.7E	SAT	(T2.5/2.5 /D0.5/24HRS)						PCN 5 UMSP										
31	030010Z	18.5N 112.5E	SAT	(T2.5/2.5 / / HRS)						NOAA-5			(CONF 01)							
32	030045Z	17.7N 114.7E	P	5 5	700	100	35	50	50	45	50	50	992	-	27 25	-	- -	-		1
33	030431Z	19.0N 113.0E	SAT	(IR DATA)						PCN 5 UMSP										
34	031130Z	17.7N 110.5E	SAT	(IR DATA)						PCN 6 UMSP										
35	031200Z	18.0N 112.6E	SAT							PCN 6 UMSP										
36	032230Z	17.8N 110.3E	SAT	(T2.5/2.5 /D0.5/24HRS)						PCN 5 UMSP										
37	032230Z	17.4N 111.0E	SAT	(T3.0/3.0 / / HRS)						PCN 6 UMSP										
38	032230Z	17.0N 111.0E	SAT	(IR DATA)						PCN 5 UMSP										
39	032304Z	17.2N 110.0E	SAT	(IR DATA)						PCN 5 UMSP										
40	040122Z	17.0N 110.0E	SAT	(T3.5/3.5 /D1.0/24HRS)						NOAA-5			(CONF 01)							
41	040413Z	17.8N 110.3E	SAT	(IR DATA)						PCN 4 UMSP										
42	040413Z	16.9N 110.0E	SAT	(T2.5/2.5 /S /29HRS)						PCN 5 UMSP										
43	041112Z	18.2N 108.5E	SAT	(IR DATA)						PCN 5 UMSP										
44	041112Z	17.8N 108.8E	SAT	(IR DATA)						PCN 5 UMSP										
45	041148Z	17.8N 108.7E	SAT	(IR DATA)						PCN 6 UMSP										
46	041148Z	17.6N 108.4E	SAT	(IR DATA)						PCN 6 UMSP										
47	041233Z	17.1N 106.4E	SAT	(IR DATA)						PCN 6 NOAA-5										
48	041254Z	17.3N 106.2E	SAT	(IR DATA)						PCN 4 UMSP										
49	041655Z	17.5N 106.2E	SAT	(IR DATA)						PCN 6 UMSP										
50	042354Z	16.9N 103.8E	SAT	(IR DATA)						PCN 5 UMSP										
51	050033Z	16.8N 103.7E	SAT	(IR DATA)						PCN 5 UMSP										
52	050038Z	17.0N 104.0E	SAT	(T1.5/1.5 /W2.0/24HRS)						NOAA-5			(CONF 01)							
53	050109Z	16.8N 103.6E	SAT	(T2.0/2.0-/ W0.5/26 HRS)						PCN 6 NOAA-5										
54	050355Z	17.1N 104.0E	SAT	(T1.0/2.0-/W1.5/24HRS)						PCN 5 UMSP										
55	050356Z	16.5N 105.2E	SAT	(IR DATA)						PCN 6 UMSP										

TYPHOON DINAH
FIX POSITIONS FOR CYCLONE NO. 12
1200Z 14 SEP TO 1800Z 23 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIENTATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	101011Z	18.3N 150.0E	SAT	(IR DATA)							NOAA-5		(CONF 02)							
2	102030Z	15.5N 151.9E	SAT	(T 0/ 0 / / HRS)						PCN 5	UMSP									
3	102234Z	18.6N 151.0E	SAT	(T1.0/1.0 / / HRS)							NOAA-5		(CONF 02)							
4	110913Z	15.2N 150.5E	SAT	(IR DATA)						PCN 5	UMSP									
5	111124Z	19.4N 146.3E	SAT	(IR DATA)							NOAA-5		(CONF 02)							
6	112013Z	19.9N 147.0E	SAT	(T 0/ 0 /S /24HRS)						PCN 5	UMSP									
7	120103Z	20.0N 145.5E	SAT	(IR DATA)						PCN 5	UMSP									
8	121011Z	21.5N 142.3E	SAT	(IR DATA)						PCN 5	UMSP									
9	121037Z	21.5N 142.1E	SAT	(IR DATA)						PCN 5	UMSP									
10	121044Z	21.2N 141.4E	SAT	(IR DATA)							NOAA-5		(CONF 01)							
11	121435Z	21.8N 141.2E	SAT	(IR DATA)						PCN 5	UMSP									
12	122113Z	21.8N 139.6E	SAT	(IR DATA)						PCN 6	UMSP									
13	122138Z	21.7N 139.2E	SAT	(T1.0/1.0 /D1.0/25HRS)						PCN 5	UMSP									
14	122138Z	20.3N 139.1E	SAT	(T 0/ 0 / / HRS)						PCN 5	UMSP									
15	122310Z	22.1N 137.1E	SAT	(IR DATA)						PCN 5	NOAA-5									
16	130135Z	22.6N 138.2E	SAT	(IR DATA)						PCN 5	UMSP									
17	130959Z	22.4N 136.0E	SAT	(IR DATA)						PCN 6	UMSP									
18	130959Z	23.1N 135.9E	SAT	(IR DATA)						PCN 6	UMSP									
19	131020Z	22.1N 135.8E	SAT	(IR DATA)						PCN 5	UMSP									
20	131020Z	23.1N 135.8E	SAT	(IR DATA)						PCN 6	UMSP									
21	131020Z	23.0N 136.0E	SAT	(IR DATA)						PCN 6	UMSP									
22	131146Z	22.3N 135.5E	SAT	(IR DATA)						PCN 5	NOAA-5									
23	131417Z	22.5N 135.0E	SAT	(IR DATA)						PCN 5	UMSP									
24	132121Z	21.7N 131.5E	SAT	(T2.0/2.0 /D1.0/24HRS)						PCN 5	UMSP									
25	132121Z	21.7N 131.6E	SAT	(T2.0/2.0 / / HRS)						PCN 5	UMSP									
26	132121Z	21.8N 132.2E	SAT	(T1.0/1.0 /D1.0/24HRS)						PCN 5	UMSP									
27	140023Z	21.6N 131.3E	SAT	(IR DATA)						PCN 5	NOAA-5									
28	140258Z	22.3N 129.9E	SAT	(T2.5/2.5 / / HRS)						PCN 3	UMSP									
29	140259Z	21.6N 130.5E	SAT	(IR DATA)						PCN 5	UMSP									
30	140259Z	22.2N 130.8E	SAT	(IR DATA)						PCN 5	UMSP									
31	140259Z	21.7N 130.7E	SAT	(IR DATA)						PCN 6	UMSP									
32	141003Z	21.7N 128.6E	SAT	(IR DATA)						PCN 5	UMSP									
33	141003Z	21.4N 128.0E	SAT	(IR DATA)						PCN 6	UMSP									
34	141003Z	21.3N 128.7E	SAT	(IR DATA)						PCN 6	UMSP									
35	141003Z	21.5N 127.9E	SAT	(IR DATA)						PCN 4	UMSP									
36	141103Z	21.6N 128.2E	SAT	(IR DATA)						PCN 5	NOAA-5									
37	141128Z	21.7N 127.9E	SAT	(IR DATA)						PCN 5	UMSP									
38	141129Z	21.6N 128.1E	SAT	(IR DATA)						PCN 5	UMSP									
39	141129Z	21.5N 127.6E	SAT	(IR DATA)						PCN 4	UMSP									
40	141208Z	21.5N 127.8E	SAT	(IR DATA)						PCN 2	NOAA-4									
41	141541Z	20.8N 127.1E	SAT	(IR DATA)						PCN 3	UMSP									
42	141541Z	20.8N 127.0E	SAT	(IR DATA)						PCN 3	UMSP									
43	142231Z	19.4N 124.5E	SAT	(IR DATA)						PCN 6	UMSP									
44	142245Z	19.4N 124.7E	SAT	(T4.0/4.0 /D2.0/25HRS)						PCN 5	UMSP									
45	142245Z	19.9N 124.3E	SAT	(T4.0/4.0 /D2.0/25HRS)						PCN 5	UMSP									
46	142245Z	19.3N 124.9E	SAT	(T3.5/3.5 / / HRS)						PCN 3	UMSP									
47	142245Z	18.7N 124.0E	SAT	(T3.5/3.5 /D1.0/21HRS)						PCN 5	UMSP									
48	150129Z	19.1N 125.1E	SAT	(T4.0/4.0 / / HRS)							NOAA-5		(CONF 02)							
49	150135Z	19.2N 124.4E	SAT	(IR DATA)						PCN 5	NOAA-5									
50	150241Z	19.0N 124.0E	SAT	(IR DATA)						PCN 3	UMSP									
51	150241Z	18.9N 123.6E	SAT	(T3.5/3.5 / / HRS)						PCN 5	UMSP									
52	150241Z	19.0N 124.0E	SAT	(IR DATA)						PCN 5	UMSP									
53	150241Z	18.9N 123.9E	SAT	(IR DATA)						PCN 3	UMSP									
54	150450Z	18.9N 123.9E	P	5 5	700	180	65	100	15	65	100	15	968	281	16 13	CIRC		22		3
55	150935Z	18.4N 123.1E	P	5 5	700	120	76	40	45	75	330	10	967	280	19 15	ELIP	SE-NW	30X15		3
56	151108Z	18.3N 122.7E	SAT	(IR DATA)						PCN 5	NOAA-4									
57	151116Z	18.3N 122.5E	SAT	(IR DATA)						PCN 5	UMSP									
58	151116Z	18.6N 120.7E	SAT	(IR DATA)						PCN 5	UMSP									
59	151128Z	17.7N 122.4E	SAT	(IR DATA)						PCN 5	UMSP									
60	151128Z	18.0N 122.5E	SAT	(IR DATA)						PCN 5	UMSP									
61	151215Z	18.0N 122.4E	SAT	(IR DATA)						PCN 5	NOAA-5									
62	151221Z	18.3N 122.8E	SAT	(IR DATA)							NOAA-5		(CONF 02)							
63	151523Z	17.8N 121.8E	SAT	(IR DATA)						PCN 5	UMSP									
64	151523Z	17.8N 121.7E	SAT	(IR DATA)						PCN 5	UMSP									
65	152228Z	17.3N 120.3E	SAT	(T4.0/4.0 /S /24HRS)						PCN 3	UMSP									
66	152228Z	17.4N 120.1E	SAT	(T4.0/4.0+/S /24HRS)						PCN 3	UMSP									
67	152228Z	17.3N 120.4E	SAT	(T4.5/4.5 /D1.0/24HRS)						PCN 3	UMSP									
68	152228Z	17.9N 119.8E	SAT	(T4.5/4.5 /D1.0/24HRS)						PCN 3	UMSP									
69	160045Z	16.3N 119.9E	SAT	(T4.0/4.0 /S /23HRS)							NOAA-5		(CONF 01)							
70	160224Z	17.0N 119.2E	SAT	(IR DATA)						PCN 3	UMSP									
71	160346Z	17.4N 119.7E	P	2 5	700	180	45	150	60	40	150	60	985	296	13 10	-	- -	-		4
72	160405Z	17.1N 119.0E	SAT	(IR DATA)						PCN 3	UMSP									
73	160935Z	17.2N 118.7E	P	2 5	700	280	50	250	25	-	-	-	983	299	14 12	-	- -	-		4
74	161104Z	16.9N 118.4E	SAT	(IR DATA)						PCN 5	UMSP									
75	161104Z	17.1N 118.5E	SAT	(IR DATA)						PCN 5	UMSP									
76	161104Z	17.0N 118.0E	SAT	(IR DATA)						PCN 4	UMSP									
77	161111Z	16.9N 118.3E	SAT	(IR DATA)						PCN 5	UMSP									
78	161111Z	16.9N 118.1E	SAT	(IR DATA)						PCN 5	UMSP									
79	161203Z	17.0N 118.5E	SAT	(IR DATA)						PCN 6	NOAA-4									
80	161257Z	17.2N 117.8E	SAT	(IR DATA)							NOAA-5		(CONF 01)							
81	161506Z	17.2N 117.6E	SAT	(IR DATA)						PCN 5	UMSP									
82	161506Z	17.4N 117.8E	SAT	(IR DATA)						PCN 5	UMSP									
83	161647Z	17.1N 117.6E	SAT	(IR DATA)						PCN 5	UMSP									
84	162211Z	16.7N 116.2E	SAT	(T5.0/5.0 /D1.0/24HRS)						PCN 5	UMSP									
85	162211Z	16.9N 116.1E	SAT	(T5.0/5.0 / / HRS)						PCN 3	UMSP									
86	162349Z	16.8N 116.2E	SAT	(T4.0/4.0+/S /25HRS)						PCN 6	UMSP									
87	162349Z	16.5N 117.8E	SAT	(T4.0/4.5 /W0.5/25HRS)						PCN 5	UMSP									
88	170157Z	17.8N 116.3E	SAT	(T4.0/4.0 /S /25HRS)							NOAA-5		(CONF 01)							
89	170450Z	17.3N 116.6E	P	5 5	700	100	45	350	30	40	20	60	983	299	12 9	-	- -	-		5
90	170945Z	17.3N 116.0E	P	5 5	700	230	58	140	110	80	140	70	983	299	12 12	-	- -	-		5

91	171053Z	17.0N	115.4E	SAT	(IR DATA)	PCN 4 DMSP	
92	171054Z	16.9N	115.5E	SAT	(IR DATA)	PCN 5 DMSP	
93	171054Z	16.9N	115.4E	SAT	(IR DATA)	PCN 5 DMSP	
94	171234Z	17.3N	116.2E	SAT	(IR DATA)	PCN 6 DMSP	
95	171234Z	17.0N	115.7E	SAT	(IR DATA)	PCN 5 DMSP	
96	171243Z	17.2N	115.5E	SAT	(IR DATA)	PCN 5 NOAA-5	
97	171248Z	17.5N	117.0E	SAT	(IR DATA)	NOAA-5	(CONF 01)
98	171630Z	16.7N	115.3E	SAT	(IR DATA)	PCN 6 DMSP	
99	171630Z	17.4N	115.8E	SAT	(IR DATA)	PCN 5 DMSP	
100	172336Z	17.9N	117.2E	SAT	(T4.5/4.5 /D0.5/24HRS)	PCN 5 DMSP	
101	172336Z	17.2N	117.3E	SAT	(T4.0/4.0 /S /24HRS)	PCN 5 DMSP	
102	180112Z	18.6N	117.2E	SAT	(T4.0/4.0 /S /23HRS)	NOAA-5	(CONF 01)
103	180120Z	18.8N	117.1E	SAT	(IR DATA)	PCN 5 NOAA-5	
104	180330Z	18.3N	117.6E	SAT	(IR DATA)	PCN 3 DMSP	
105	180330Z	18.2N	117.4E	SAT	(IR DATA)	PCN 3 DMSP	
106	180500Z	18.6N	117.5E	SRDR	- WELL DEFINED EYE TRACKED FOR 90 MIN -		USS OKLAHOMA CITY (CG-5)
107	180707Z	18.6N	117.9E	SRDR	- EYE POSIT -		USS OKLAHOMA CITY (CG-5)
108	181036Z	18.8N	117.6E	SAT	(IR DATA)	PCN 3 DMSP	
109	181036Z	18.9N	117.6E	SAT	(IR DATA)	PCN 3 DMSP	
110	181159Z	18.9N	117.8E	SAT	(IR DATA)	PCN 3 NOAA-5	
111	181205Z	18.5N	117.8E	SAT	(IR DATA)	NOAA-5	(CONF 01)
112	181218Z	19.1N	117.4E	SAT	(IR DATA)	PCN 6 DMSP	
113	181612Z	19.0N	118.2E	SAT	(IR DATA)	PCN 6 DMSP	
114	181612Z	19.3N	117.6E	SAT	(IR DATA)	PCN 5 DMSP	
115	182201Z	19.6N	118.2E	P	2 2 700 220 62 120 37 60 320 15 972 28? 15 13 ELIP N-S 40X30		6
116	182318Z	19.4N	119.2E	SAT	(T4.0/4.5-/W0.5/24HRS)	PCN 6 DMSP	
117	182318Z	19.5N	119.0E	SAT	(T4.5/4.5 /D0.5/24HRS)	PCN 3 DMSP	
118	182318Z	19.5N	119.2E	SAT	(T4.0/4.0 / / HRS)	PCN 5 DMSP	
119	190001Z	19.3N	118.0E	SRDR	- APPARENT RADAR EYE - FEEDER BANDS DISTINCT		USS OKLAHOMA CITY (CG-5)
120	190028Z	19.5N	119.1E	SAT	(T4.5/4.5 /D0.5/23HRS)	NOAA-5	(CONF 01)
121	190056Z	19.1N	118.1E	SAT	(T4.5/5.0 / / HRS)	PCN 5 NOAA-5	
122	190200Z	19.5N	118.8E	LRDR	- 45///		- - - - 22.6N 120.3E -
123	190200Z	19.4N	117.9E	SRDR	- RADAR STORM CENTER		USS OKLAHOMA CITY (CG-5)
124	190300Z	19.6N	118.6E	LRDR	- 45///		- - - - 22.6N 120.3E -
125	190600Z	19.8N	118.6E	LRDR	- 45///		- - - - 22.6N 120.3E -
126	190900Z	19.8N	118.7E	LRDR	- 1290/		- - - - 22.6N 120.3E -
127	191115Z	19.8N	118.5E	SAT	(IR DATA)	PCN 5 NOAA-5	
128	191200Z	20.0N	118.8E	LRDR	- 1291/		- - - - 22.6N 120.3E -
129	191201Z	19.2N	119.3E	SAT	(IR DATA)	PCN 5 DMSP	
130	191201Z	19.7N	119.0E	SAT	(IR DATA)	PCN 1 DMSP	
131	191300Z	20.0N	118.9E	LRDR	- 1291/		- - - - 22.6N 120.3E -
132	191317Z	20.2N	118.7E	SAT	(IR DATA)	NOAA-5	(CONF 02)
133	191400Z	20.0N	118.9E	LRDR	- 1291/		- - - - 22.6N 120.3E -
134	191554Z	19.7N	119.0E	SAT	(IR DATA)	PCN 5 DMSP	
135	191554Z	19.7N	118.9E	SAT	(IR DATA)	PCN 1 DMSP	
136	191600Z	20.0N	118.9E	LRDR	- 1291/		- - - - 22.6N 120.3E -
137	191700Z	20.1N	118.9E	LRDR	- 1097/		- - - - 22.6N 120.3E -
138	191800Z	20.1N	119.0E	LRDR	- 1091/		- - - - 22.6N 120.3E -
139	191900Z	20.1N	119.0E	LRDR	- 1091/		- - - - 22.6N 120.3E -
140	192000Z	20.2N	119.1E	LRDR	- 1097/		- - - - 22.6N 120.3E -
141	192100Z	20.2N	119.1E	LRDR	- 1097/		- - - - 22.6N 120.3E -
142	192200Z	20.3N	119.1E	LRDR	- 1097/		- - - - 22.6N 120.3E -
143	192205Z	20.0N	119.1E	P	- 3 700 140 74 60 36 - - - 964 27? 16 13 CIRC 40		7
144	192301Z	20.0N	119.6E	SAT	(T6.0/6.0 /D1.5/24HRS)	PCN 1 DMSP	
145	192312Z	20.1N	119.4E	SAT	(T4.5/4.5 / / HRS)	PCN 1 DMSP	
146	200000Z	20.2N	119.4E	LRDR	- 1097/		- - - - 22.6N 120.3E -
147	200140Z	19.9N	119.3E	SAT	(T5.0/5.0 /D0.5/25HRS)	NOAA-5	(CONF 01)
148	200200Z	20.2N	119.1E	LRDR	- 25/6/		- - - - 22.6N 120.3E -
149	200300Z	20.2N	119.1E	LRDR	- 21972		- - - - 22.6N 120.3E -
150	200332Z	20.1N	119.3E	P	2 8 700 70 75 340 40 - - - 965 278 16 14 CIRC 35		7
151	200500Z	20.4N	118.9E	LRDR	- 25712		- - - - 22.6N 120.3E -
152	201000Z	20.3N	119.0E	LRDR	- 2063/		- - - - 22.6N 120.3E -
153	201100Z	20.4N	118.9E	LRDR	- 25792		- - - - 22.6N 120.3E -
154	201144Z	20.1N	119.3E	SAT	(IR DATA)	PCN 5 DMSP	
155	201144Z	20.3N	119.4E	SAT	(IR DATA)	PCN 1 DMSP	
156	201157Z	20.5N	119.1E	SAT	(IR DATA)	PCN 2 DMSP	
157	201157Z	20.2N	119.1E	SAT	(IR DATA)	PCN 4 DMSP	
158	201200Z	20.2N	119.1E	LRDR	- 2171/		- - - - 22.6N 120.3E -
159	201228Z	20.2N	119.1E	SAT	(IR DATA)	PCN 3 NOAA-5	
160	201234Z	20.3N	119.1E	SAT	(IR DATA)	NOAA-5	(CONF 02)
161	201300Z	20.1N	119.0E	LRDR	- 2081/		- - - - 22.6N 120.3E -
162	201400Z	20.1N	118.9E	LRDR	- 26///		- - - - 22.6N 120.3E -
163	201500Z	20.1N	118.9E	LRDR	- 25///		- - - - 22.6N 120.3E -
164	201537Z	20.4N	118.9E	SAT	(IR DATA)	PCN 1 DMSP	
165	201600Z	20.1N	118.8E	LRDR	- 55///		- - - - 22.6N 120.3E -
166	201700Z	20.1N	118.7E	LRDR	- 55///		- - - - 22.6N 120.3E -
167	201800Z	20.2N	118.6E	LRDR	- 55///		- - - - 22.6N 120.3E -
168	201900Z	20.1N	118.5E	LRDR	- 55///		- - - - 22.6N 120.3E -
169	202000Z	20.1N	118.5E	LRDR	- /////		- - - - 22.6N 120.3E -
170	202150Z	20.1N	118.8E	P	10 700 140 60 40 40 - - - 970 283 13 11 ELIP N-S 20X5		8
171	202244Z	20.0N	118.5E	SAT	(T4.5/4.5 / / HRS)	PCN 5 DMSP	
172	202244Z	20.0N	118.2E	SAT	(IR DATA)	PCN 3 DMSP	
173	202244Z	20.3N	118.6E	SAT	(T4.0/4.0 / / HRS)	PCN 5 DMSP	
174	202244Z	20.3N	118.2E	SAT	(T6.0/6.0 /S /24HRS)	PCN 1 DMSP	
175	202300Z	19.9N	118.4E	SAT	(IR DATA)	PCN 1 DMSP	
176	202300Z	20.0N	118.3E	SAT	(T3.5/4.5-/W1.0/24HRS)	PCN 3 DMSP	
177	210000Z	20.0N	118.5E	LRDR	- 5////		- - - - 22.6N 120.3E -
178	210057Z	19.5N	118.5E	SAT	(T5.0/5.0 /S /23HRS)	NOAA-5	(CONF 01)
179	210100Z	20.2N	118.5E	LRDR	- 45///		- - - - 22.6N 120.3E -
180	210104Z	19.9N	118.5E	SAT	(IR DATA)	PCN 3 NOAA-5	

181	210200Z	20.3N	118.6E	LRDR		-	45///												-	- -	-	22.6N	120.3E	-
182	210300Z	20.4N	118.5E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
183	210343Z	19.8N	118.1E	P	5	10	700	350	50	240	50	40	150	10	974	28!	13	10	-	- -	-			H
184	210400Z	20.4N	118.4E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
185	210500Z	20.4N	118.2E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
186	210600Z	20.5N	118.2E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
187	210800Z	20.4N	118.0E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
188	210900Z	20.3N	117.9E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
189	211100Z	20.1N	117.8E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
190	211127Z	19.7N	117.4E	SAT	(IR DATA)						PCN 3		UMSP											
191	211127Z	19.7N	117.1E	SAT	(IR DATA)						PCN 5		UMSP											
192	211144Z	19.7N	117.3E	SAT	(IR DATA)						PCN 3		NOAA-5											
193	211145Z	19.7N	117.3E	SAT	(IR DATA)						PCN 3		UMSP											
194	211145Z	19.8N	117.1E	SAT	(IR DATA)						PCN 1		UMSP											
195	211200Z	20.1N	117.6E	LRDR		-	55///												-	- -	-	22.6N	120.3E	-
196	211215Z	20.0N	118.0E	SAT	(IR DATA)								NOAA-5	(CONF 01)										
197	211300Z	20.1N	117.6E	LRDR		-	/////												-	- -	-	22.6N	120.3E	-
198	211519Z	19.5N	116.6E	SAT	(IR DATA)						PCN 5		UMSP											
199	211519Z	19.6N	116.2E	SAT	(IR DATA)						PCN 3		UMSP											
200	212227Z	18.9N	115.9E	SAT	(T2.5/3.5-/W2.0/24HRS)						PCN 5		UMSP											
201	212227Z	18.6N	115.9E	SAT	(T2.5/3.5-/W1.0/24HRS)						PCN 3		UMSP											
202	212248Z	18.8N	115.8E	SAT	(IR DATA)						PCN 5		UMSP											
203	212248Z	19.2N	115.2E	SAT	(IR DATA)						PCN 6		UMSP											
204	212253Z	18.3N	115.9E	P	-	3	700	160	60	50	50	50	300	15	984	294	14	13	-	- -	-			9
205	220209Z	17.8N	115.5E	SAT	(T5.0/5.0 /S /25HRS)								NOAA-5	(CONF 01)										
206	220343Z	18.0N	115.1E	P	-	3	700	150	65	70	30	-	-	-	985	295	12	10	-	- -	-			9
207	220401Z	18.0N	115.1E	SAT	(T4.0/5.0 /W2.0/29HRS)						PCN 1		UMSP											
208	221110Z	17.6N	113.8E	SAT	(IR DATA)						PCN 3		UMSP											
209	221110Z	17.7N	113.7E	SAT	(IR DATA)						PCN 3		UMSP											
210	221133Z	17.6N	113.8E	SAT	(IR DATA)						PCN 3		UMSP											
211	221133Z	17.5N	113.3E	SAT	(IR DATA)						PCN 4		UMSP											
212	221256Z	17.1N	113.8E	SAT	(IR DATA)						PCN 4		NOAA-5											
213	221301Z	17.2N	113.5E	SAT	(IR DATA)								NOAA-5	(CONF 01)										
214	221535Z	16.6N	113.5E	P	5	10	700	150	45	20	15	-	-	-	986	298	13	13	-	- -	-			10
215	221643Z	17.4N	112.5E	SAT	(IR DATA)						PCN 3		UMSP											
216	222352Z	15.2N	112.2E	SAT	(T3.0/4.0-/W1.0/20HRS)						PCN 3		UMSP											
217	230127Z	15.2N	111.9E	SAT	(T3.5/4.0 /W1.5/23HRS)								NOAA-5	(CONF 01)										
218	230132Z	15.3N	112.3E	SAT	(T2.5/3.0 / / HRS)						PCN 5		NOAA-5											
219	230344Z	14.1N	111.9E	SAT	(T3.5/3.5 / / HRS)						PCN 5		UMSP											
220	230344Z	15.1N	111.2E	SAT	(IR DATA)						PCN 3		UMSP											
221	231212Z	14.0N	110.1E	SAT	(IR DATA)						PCN 6		NOAA-5											
222	231234Z	14.3N	109.4E	SAT	(IR DATA)						PCN 6		UMSP											
223	231625Z	13.6N	108.8E	SAT	(IR DATA)						PCN 5		UMSP											
224	240048Z	13.2N	110.0E	SAT	(T2.0/2.5 /W0.5/23HRS)						PCN 5		NOAA-5											
225	240238Z	13.0N	109.0E	SAT	(T2.5/3.0 /W1.0/25HRS)								NOAA-5	(CONF 02)										

TROPICAL STORM EMMA
FIX POSITIONS FOR CYCLONE NO. 13
0600Z 15 SEP TO 0600Z 20 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	120856Z	17.2N 145.5E	SAT	(IR DATA)					PCN 5	UMSP										
2	121011Z	17.3N 145.2E	SAT	(IR DATA)					PCN 5	UMSP										
3	121435Z	17.6N 145.7E	SAT	(IR DATA)					PCN 5	UMSP										
4	122114Z	18.4N 145.3E	SAT	(IR DATA)					PCN 6	UMSP										
5	122138Z	18.4N 145.6E	SAT	(T 0/ 0 / / HRS)					PCN 5	UMSP										
6	122310Z	18.3N 145.7E	SAT	(IR DATA)					PCN 5	NOAA-5										
7	130135Z	17.8N 146.6E	SAT	(IR DATA)					PCN 5	UMSP										
8	132120Z	18.3N 146.4E	SAT	(T 0/ 0 / / HRS)					PCN 5	UMSP										
9	132121Z	18.1N 144.3E	SAT	(T1.0/1.0 /D1.0/24HRS)					PCN 3	UMSP										
10	132226Z	18.2N 144.3E	SAT	(IR DATA)					PCN 3	NOAA-5										
11	140117Z	18.2N 144.4E	SAT	(IR DATA)					PCN 5	UMSP										
12	140117Z	19.3N 145.3E	SAT	(T1.0/1.0 / / HRS)					PCN 6	UMSP										
13	140947Z	18.5N 142.2E	SAT	(IR DATA)					PCN 6	UMSP										
14	141003Z	18.7N 141.9E	SAT	(IR DATA)					PCN 5	UMSP										
15	141003Z	19.1N 141.7E	SAT	(IR DATA)					PCN 6	UMSP										
16	141013Z	18.7N 142.0E	SAT	(IR DATA)					PCN 5	NOAA-4										
17	141103Z	18.6N 141.7E	SAT	(IR DATA)					PCN 5	NOAA-5										
18	141359Z	18.1N 141.8E	SAT	(IR DATA)					PCN 5	UMSP										
19	141359Z	18.2N 141.7E	SAT	(IR DATA)					PCN 5	UMSP										
20	142050Z	19.5N 142.3E	SAT	(IR DATA)					PCN 4	UMSP										
21	142104Z	20.0N 142.7E	SAT	(T2.0/2.0 /D1.0/24HRS)					PCN 5	UMSP										
22	142104Z	20.1N 142.4E	SAT	(IR DATA)					PCN 3	UMSP										
23	142104Z	20.1N 142.4E	SAT	(T2.5/2.5 / / HRS)					PCN 3	UMSP										
24	142332Z	21.1N 146.1E	SAT	(T2.0/2.0 / / HRS)						NOAA-5		(CONF 02)								
25	142339Z	20.0N 142.8E	SAT	(IR DATA)					PCN 3	NOAA-5										
26	150100Z	19.9N 143.3E	SAT	(IR DATA)					PCN 5	UMSP										
27	150300Z	20.8N 142.9E	P	10 15	700	210	45	130	45	35	130	45	983	-	24 25	-	- -	-		3
28	150356Z	21.3N 143.0E	P	13 7	700	30	24	300	30	20	300	30	986	296	14 14	-	- -	-		3
29	150934Z	21.8N 143.6E	SAT	(IR DATA)					PCN 6	UMSP										
30	150946Z	21.9N 143.5E	SAT	(IR DATA)					PCN 5	UMSP										
31	150946Z	21.7N 143.8E	SAT	(IR DATA)					PCN 5	UMSP										
32	151019Z	22.0N 143.2E	SAT	(IR DATA)					PCN 5	NOAA-5										
33	151342Z	22.8N 144.0E	SAT	(IR DATA)					PCN 5	UMSP										
34	151342Z	22.1N 143.7E	SAT	(IR DATA)					PCN 6	UMSP										
35	152046Z	24.2N 144.7E	SAT	(T3.0/3.0 /D1.0/24HRS)					PCN 5	UMSP										
36	152247Z	24.1N 144.9E	SAT	(T3.0/3.0 /D1.0/23HRS)						NOAA-5		(CONF 02)								
37	152255Z	24.6N 144.8E	SAT	(IR DATA)					PCN 5	NOAA-5										
38	160042Z	25.4N 143.8E	SAT	(IR DATA)					PCN 5	UMSP										
39	160224Z	25.3N 143.6E	SAT	(T3.0/3.0 / / HRS)					PCN 3	UMSP										
40	160353Z	25.1N 144.0E	P	10 15	700	260	60	190	45	55	190	90	979	291	13 12	-	- -	-		5
41	160922Z	27.1N 144.3E	SAT	(IR DATA)					PCN 6	UMSP										
42	160929Z	27.1N 144.4E	SAT	(IR DATA)					PCN 5	UMSP										
43	160929Z	26.3N 144.3E	SAT	(IR DATA)					PCN 3	UMSP										
44	160929Z	25.8N 143.7E	SAT	(IR DATA)					PCN 3	UMSP										
45	161008Z	26.7N 144.4E	SAT	(IR DATA)					PCN 5	NOAA-4										
46	161104Z	27.1N 144.7E	SAT	(IR DATA)					PCN 5	UMSP										
47	161104Z	26.2N 144.4E	SAT	(IR DATA)					PCN 3	UMSP										
48	161202Z	25.7N 143.0E	SAT	(IR DATA)						NOAA-5		(CONF 01)								
49	161506Z	27.2N 144.9E	SAT	(IR DATA)					PCN 5	UMSP										
50	161506Z	25.9N 144.1E	SAT	(IR DATA)					PCN 5	UMSP										
51	162029Z	27.5N 146.0E	SAT	(T2.0/3.0 /W1.0/24HRS)					PCN 3	UMSP										
52	162145Z	27.0N 144.8E	P	5 15	700	270	50	200	120	35	200	120	966	-	13 14	-	- -	-		6
53	162207Z	26.3N 144.4E	SAT	(T3.0/3.0 /S /21HRS)					PCN 5	UMSP										
54	162358Z	27.1N 144.0E	SAT	(T3.0/3.0 /S /25HRS)						NOAA-5		(CONF 01)								
55	170007Z	26.9N 144.6E	SAT	(IR DATA)					PCN 3	NOAA-5										
56	170206Z	27.3N 144.6E	SAT	(IR DATA)					PCN 5	UMSP										
57	170206Z	28.0N 145.3E	SAT	(T3.0/3.0 / / HRS)					PCN 5	UMSP										
58	170240Z	27.7N 144.4E	P	5 15	700	90	60	50	160	50	20	120	972	-	14 14	-	- -	-		6
59	170911Z	28.8N 144.0E	SAT	(IR DATA)					PCN 6	UMSP										
60	170912Z	28.4N 144.1E	SAT	(IR DATA)					PCN 5	UMSP										
61	171052Z	29.6N 144.0E	SAT	(IR DATA)					PCN 6	UMSP										
62	171104Z	29.0N 144.3E	SAT	(IR DATA)					PCN 5	NOAA-4										
63	171118Z	28.8N 143.5E	SAT	(IR DATA)						NOAA-5		(CONF 01)								
64	171448Z	29.2N 144.0E	SAT	(IR DATA)					PCN 5	UMSP										
65	171448Z	29.1N 143.6E	SAT	(IR DATA)					PCN 3	UMSP										
66	172012Z	29.1N 143.6E	SAT	(T3.0/3.0-/D1.0/24HRS)					PCN 5	UMSP										
67	172012Z	30.0N 144.5E	SAT	(T2.0/2.0 / / HRS)					PCN 6	UMSP										
68	172303Z	29.1N 143.6E	SAT	(IR DATA)					PCN 5	NOAA-5										
69	180102Z	29.0N 141.8E	SAT	(T3.0/3.0 /S /25HRS)						NOAA-5		(CONF 01)								
70	180108Z	29.6N 142.7E	SAT	(IR DATA)					PCN 3	UMSP										
71	180148Z	29.5N 142.6E	SAT	(T2.0/3.0-/W1.0/24HRS)					PCN 3	UMSP										
72	180237Z	28.8N 142.0E	P	5 5	700	210	45	130	90	50	40	80	981	294	14 13	-	- -	-		7
73	181003Z	29.3N 141.2E	SAT	(IR DATA)					PCN 5	NOAA-5										
74	181012Z	29.5N 140.0E	SAT	(IR DATA)						NOAA-5		(CONF 01)								
75	181036Z	29.3N 141.0E	SAT	(IR DATA)					PCN 5	UMSP										
76	181036Z	30.0N 141.0E	SAT	(IR DATA)					PCN 3	UMSP										
77	181040Z	29.9N 141.4E	SAT	(IR DATA)					PCN 3	UMSP										
78	181430Z	29.8N 141.0E	SAT	(IR DATA)					PCN 5	UMSP										
79	181430Z	30.8N 140.9E	SAT	(IR DATA)					PCN 5	UMSP										
80	181533Z	30.6N 140.2E	P	2 5	700	270	72	180	100	-	-	-	977	290	14 14	-	- -	-		8
81	182000Z	31.7N 140.3E	LRDR	- 6///3												-	- -	-	35.3N 138.7E	-
82	182100Z	32.0N 140.2E	LRDR	- 6///3												-	- -	-	35.3N 138.7E	-
83	182137Z	31.7N 140.4E	SAT	(T4.0/4.0 /D1.0/25HRS)					PCN 5	UMSP										
84	182137Z	31.4N 139.8E	SAT	(T3.5/3.5 /D1.5/25HRS)					PCN 6	UMSP										
85	182137Z	31.4N 139.8E	SAT	(T4.0/4.0 / / HRS)					PCN 3	UMSP										
86	182137Z	31.5N 139.8E	SAT	(T3.5/3.5 /D1.5/20HRS)					PCN 3	UMSP										
87	182200Z	32.2N 140.3E	LRDR	- 5///3												-	- -	-	35.3N 138.7E	-
88	182228Z	31.8N 140.5E	SAT	(T3.0/3.0 /S /21HRS)						NOAA-5		(CONF 01)								
89	182300Z	32.3N 140.2E	LRDR	- 5///5												-	- -	-	35.3N 138.7E	-
90	190000Z	32.5N 140.3E	LRDR	- 6///6												-	- -	-	35.3N 138.7E	-

91	190030Z	31.9N 140.7E	SAT	(IR DATA)						PCN 5 NOAA-5										
92	190100Z	32.3N 140.3E	LRDR	- 6///6												-	- -	-	35.3N 138.7E	-
93	190131Z	32.7N 140.6E	SAT	(IR DATA)						PCN 5 UMSP										
94	190131Z	32.4N 140.2E	SAT	(IR DATA)						PCN 3 UMSP										
95	190300Z	32.8N 140.2E	LRDR	- 6///6												-	- -	-	35.3N 138.7E	-
96	190345Z	33.3N 140.6E	P	5 10	700	50	35	320	90	-	-	-	981	294	14 14	-	- -	-		10
97	190400Z	32.9N 140.0E	LRDR	- 6///6												-	- -	-	35.3N 138.7E	-
98	190500Z	33.2N 140.0E	LRDR	- 6///5												-	- -	-	35.3N 138.7E	-
99	190700Z	33.7N 140.4E	LRDR	- /////												-	- -	-	35.3N 138.7E	-
100	190800Z	34.2N 140.6E	LRDR	- 6////												-	- -	-	35.3N 138.7E	-
101	190900Z	34.5N 140.9E	LRDR	- 6////												-	- -	-	35.3N 138.7E	-
102	191000Z	34.6N 141.3E	LRDR	- 6////												-	- -	-	35.3N 138.7E	-
103	191019Z	34.7N 141.1E	SAT	(IR DATA)						PCN 5 UMSP										
104	191019Z	34.7N 141.0E	SAT	(IR DATA)						PCN 5 UMSP										
105	191019Z	35.9N 141.2E	SAT	(IR DATA)						PCN 4 UMSP										
106	191019Z	34.8N 140.6E	SAT	(IR DATA)						PCN 5 UMSP										
107	191100Z	34.7N 142.1E	LRDR	- 6////												-	- -	-	35.3N 138.7E	-
108	191115Z	34.9N 141.7E	SAT	(IR DATA)						PCN 5 NOAA-5										
109	191413Z	35.7N 142.8E	SAT	(IR DATA)						PCN 5 UMSP										
110	191413Z	35.9N 143.0E	SAT	(IR DATA)						PCN 6 UMSP										
111	191413Z	36.0N 142.2E	SAT	(IR DATA)						PCN 3 UMSP										
112	192120Z	38.2N 145.2E	SAT	(T2.0/3.0-/W2.0/24HRS)						PCN 5 UMSP										
113	192120Z	38.1N 145.4E	SAT	(T2.0/3.0-/W1.5/24HRS)						PCN 6 UMSP										
114	192120Z	38.4N 145.5E	SAT	(T2.5/2.5 /W0.5/24HRS)						PCN 5 UMSP										
115	192120Z	38.8N 144.6E	SAT	(T2.5/3.5-/W1.0/24HRS)						PCN 5 UMSP										
116	192337Z	39.0N 146.0E	SAT	(T2.5/3.0 /W0.5/25HRS)						NOAA-5			(CONF 01)							
117	192352Z	39.0N 145.2E	SAT	(IR DATA)						PCN 5 NOAA-5										
118	201032Z	43.5N 151.3E	SAT	(IR DATA)						PCN 6 NOAA-5										

TROPICAL STORM FREDA
FIX POSITIONS FOR CYCLONE NO. 14
0000Z 23 SEP TO 0000Z 25 SEP

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	182137Z	15.2N 139.2E	SAT	(T 0/ 0 / / HRS)						PCN 5 UMSP										
2	191019Z	14.5N 137.5E	SAT	(IR DATA)						PCN 5 UMSP										
3	192124Z	13.4N 136.1E	SAT	(T 0/ 0 /S /24HRS)						PCN 5 UMSP										
4	201002Z	13.0N 134.2E	SAT	(IR DATA)						PCN 5 UMSP										
5	202103Z	13.5N 134.2E	SAT	(T1.0/1.0 /D1.0/24HRS)						PCN 5 UMSP										
6	210945Z	13.8N 133.1E	SAT	(IR DATA)						PCN 5 UMSP										
7	211003Z	13.7N 133.0E	SAT	(IR DATA)						PCN 5 UMSP										
8	211143Z	14.1N 132.9E	SAT	(IR DATA)						PCN 5 NOAA-5										
9	211519Z	14.3N 132.1E	SAT	(IR DATA)						PCN 6 UMSP										
10	212227Z	17.1N 130.3E	SAT	(T1.0/1.0 /S /25HRS)						PCN 5 UMSP										
11	212248Z	17.0N 130.2E	SAT	(IR DATA)						PCN 5 UMSP										
12	220204Z	15.2N 129.9E	P	5 25	700	190	35	120	100	25	120	100	1001	-	23 23	-	- -	-		1
13	221110Z	17.0N 129.5E	SAT	(IR DATA)						PCN 5 UMSP										
14	221133Z	16.9N 128.5E	SAT	(IR DATA)						PCN 5 UMSP										
15	222214Z	18.0N 126.3E	SAT	(IR DATA)						PCN 5 UMSP										
16	222234Z	18.2N 126.2E	SAT	(T1.0/1.0 /S /24HRS)						PCN 5 UMSP										
17	222336Z	19.4N 126.5E	SAT	(IR DATA)						PCN 5 NOAA-5										
18	230125Z	18.0N 123.6E	SAT	(T1.5/1.5 / / HRS)						NOAA-5			(CONF 01)							
19	230202Z	18.8N 122.9E	SAT	(IR DATA)						PCN 5 UMSP										
20	230344Z	18.4N 123.3E	SAT	(T1.0/1.0 / / HRS)						PCN 3 UMSP										
21	230344Z	17.9N 123.2E	SAT	(T1.0/1.0 / / HRS)						PCN 5 UMSP										
22	231052Z	19.5N 120.8E	SAT	(IR DATA)						PCN 5 UMSP										
23	231121Z	19.7N 120.6E	SAT	(IR DATA)						PCN 5 UMSP										
24	231121Z	19.9N 120.5E	SAT	(IR DATA)						PCN 5 UMSP										
25	231445Z	19.1N 119.3E	P	5 5	700	230	60	120	15	-	-	-	988	298	15 12	-	- -	-		2
26	231625Z	18.7N 118.3E	SAT	(IR DATA)						PCN 5 UMSP										
27	231626Z	18.6N 119.4E	SAT	(IR DATA)						PCN 6 UMSP										
28	232153Z	19.5N 117.7E	SAT	(IR DATA)						PCN 5 UMSP										
29	231940Z	19.2N 117.4E	SRDR	- STORM CENTER															USS OKLAHOMA CITY (CG-7)	
30	232153Z	19.5N 117.5E	SAT	(IR DATA)						PCN 5 UMSP										
31	232224Z	19.4N 117.4E	SAT	(IR DATA)						PCN 5 UMSP										
32	232300Z	19.9N 117.4E	LRDR	- 7////												-	- -	-	16.3N 120.6E	-
33	232335Z	19.3N 117.3E	SAT	(IR DATA)						PCN 5 UMSP										
34	240000Z	19.8N 117.1E	LRDR	- 7////												-	- -	-	16.3N 120.6E	-
35	240042Z	19.6N 116.1E	SAT	(T3.5/3.5 /D2.0/24HRS)						NOAA-5			(CONF 01)							
36	240048Z	19.7N 115.1E	SAT	(T4.0/4.0 / / HRS)						PCN 3 NOAA-5										
37	240610Z	20.4N 114.8E	LRDR	- 10912												-	- -	-	22.3N 114.2E	-
38	240640Z	20.3N 115.0E	LRDR	- 20912												-	- -	-	22.3N 114.2E	-
39	240800Z	20.6N 114.5E	LRDR	- 4//4/												-	- -	-	22.3N 114.2E	-
40	241100Z	21.1N 113.8E	LRDR	- 5//4/												-	- -	-	22.3N 114.2E	-
41	241200Z	21.1N 113.6E	LRDR	- 45/1/												-	- -	-	22.3N 114.2E	-
42	241217Z	20.4N 113.9E	SAT	(IR DATA)						PCN 5 UMSP										
43	241217Z	21.2N 113.2E	SAT	(IR DATA)						PCN 5 UMSP										
44	241300Z	21.0N 113.2E	LRDR	- 5//4/												-	- -	-	22.3N 114.2E	-
45	241400Z	21.2N 112.9E	LRDR	- /////												-	- -	-	22.3N 114.2E	-
46	241500Z	21.3N 112.5E	LRDR	- /////												-	- -	-	22.3N 114.2E	-
47	241607Z	21.3N 112.2E	SAT	(IR DATA)						PCN 5 UMSP										
48	241608Z	22.0N 111.6E	SAT	(IR DATA)						PCN 5 UMSP										
49	241700Z	21.6N 111.7E	LRDR	- /////												-	- -	-	22.3N 114.2E	-
50	242314Z	22.0N 108.9E	SAT	(IR DATA)						PCN 6 UMSP										
51	242314Z	22.1N 110.0E	SAT	(IR DATA)						PCN 5 UMSP										
52	250153Z	21.7N 109.8E	SAT	(T3.5/3.5 /S /25HRS)						NOAA-5			(CONF 02)							
53	251240Z	23.0N 107.5E	SAT	(IR DATA)						PCN 6 NOAA-5										
54	260117Z	25.3N 105.8E	SAT	(IR DATA)						PCN 5 NOAA-5										

TYPHOON GILDA
FIX POSITIONS FOR CYCLONE NO. 15
0000Z 03 OCT TO 0600Z 10 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	011013Z	12.6N 158.3E	SAT	(IR DATA)			PCN 5 NOAA-5								
2	012249Z	13.1N 157.9E	SAT	(T1.0/1.0 / / HRS)			PCN 5 NOAA-5								
3	020105Z	14.0N 156.9E	SAT	(IR DATA)			PCN 6 UMSP								
4	020929Z	13.6N 157.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
5	020931Z	15.9N 155.4E	SAT	(IR DATA)			PCN 6 UMSP								
6	022009Z	16.5N 155.6E	SAT	(T2.0/2.0 / / HRS)			NOAA-5	(CONF 01)							
7	022101Z	16.7N 156.7E	SAT	(IR DATA)			PCN 6 UMSP								
8	022205Z	16.6N 155.8E	SAT	(T2.0/2.0 /D1.0/24HRS)			PCN 5 NOAA-5								
9	022234Z	16.5N 155.8E	P	10 5	700	180 38 130 150	40 130 150	1002	-	26 24	-	- -	-		1
10	030007Z	17.4N 156.0E	SAT	(T2.0/2.0 / / HRS)			PCN 4 UMSP								
11	030205Z	16.5N 156.3E	P	13 30	700	100 20 340 160	25 340 160	999	301	12 12	-	- -	-		1
12	030801Z	17.8N 156.3E	SAT	(IR DATA)			PCN 6 UMSP								
13	030919Z	17.2N 155.9E	SAT	(IR DATA)			PCN 5 UMSP								
14	031555Z	17.9N 156.6E	P	2 5	700	60 27 330 30	- - -	994	304	16 13	-	- -	-		2
15	032043Z	18.6N 156.7E	SAT	(T2.5/2.5 /D0.5/21HRS)			PCN 6 UMSP								
16	032252Z	18.0N 155.8E	SAT	(T2.0/2.0 /S /25HRS)			PCN 6 NOAA-4								
17	032310Z	17.8N 155.6E	SAT	(T2.5/2.5 /D 0.5/27HRS)			NOAA-5	(CONF 01)							
18	032318Z	18.1N 155.7E	SAT	(IR DATA)			PCN 6 NOAA-5								
19	040029Z	17.8N 155.7E	SAT	(IR DATA)			PCN 4 UMSP								
20	040240Z	18.0N 155.5E	P	10 5	700	260 60 170 25	40 170 25	988	-	27 23	-	- -	-		3
21	040926Z	19.8N 156.3E	SAT	(IR DATA)			PCN 6 UMSP								
22	040958Z	18.9N 155.0E	SAT	(IR DATA)			PCN 5 NOAA-5								
23	041003Z	18.0N 155.0E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
24	041311Z	20.4N 154.9E	SAT	(IR DATA)			PCN 6 UMSP								
25	041459Z	19.8N 154.0E	P	2 5	700	210 40 130 30	- - -	989	299	19 16	-	- -	-		4
26	042026Z	20.8N 153.2E	SAT	(T3.5/3.5 /D1.0/24HRS)			PCN 4 UMSP								
27	042152Z	21.1N 152.7E	SAT	(T3.0/3.0 /D1.0/23HRS)			PCN 6 NOAA-4								
28	042234Z	20.5N 156.4E	SAT	(IR DATA)			PCN 6 NOAA-5								
29	050012Z	21.0N 151.6E	SAT	(IR DATA)			PCN 6 UMSP								
30	050239Z	20.7N 152.5E	P	15 2	700	100 80 360 5	80 120 50	974	286	14 14	ELIP	N-S	10X 5		5
31	050455Z	21.9N 151.0E	SAT	(IR DATA)			PCN 4 UMSP								
32	050904Z	21.9N 151.5E	SAT	(IR DATA)			PCN 4 UMSP								
33	050914Z	21.9N 150.6E	SAT	(IR DATA)			PCN 6 NOAA-5								
34	051110Z	22.0N 150.7E	SAT	(IR DATA)			PCN 5 NOAA-5								
35	051116Z	21.6N 150.5E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
36	051254Z	21.9N 150.9E	SAT	(IR DATA)			PCN 4 UMSP								
37	051436Z	21.0N 150.9E	SAT				PCN 5 UMSP								
38	051525Z	22.1N 150.4E	P	5 5	700	350 50 240 40	- - -	976	288	14 14	-	- -	-		6
39	052009Z	22.9N 150.3E	SAT	(T4.0/4.0-/D1.0 /22 HRS)			PCN 3 UMSP								
40	052009Z	22.7N 150.1E	SAT	(T3.5/3.5 /S /24HRS)			PCN 4 UMSP								
41	052139Z	23.5N 150.6E	SAT	(IR DATA)			PCN 6 UMSP								
42	052139Z	22.8N 150.3E	SAT	(IR DATA)			PCN 6 UMSP								
43	052247Z	23.0N 150.1E	SAT	(IR DATA)			PCN 6 NOAA-4								
44	052346Z	23.2N 150.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
45	060136Z	23.7N 150.0E	SAT	(IR DATA)			PCN 5 UMSP								
46	060627Z	23.8N 149.1E	P	15 5	700	270 40 200 50	45 200 50	986	291	17 15	-	- -	-		8
47	060851Z	25.2N 148.8E	SAT	(IR DATA)			PCN 6 UMSP								
48	060852Z	25.1N 148.9E	SAT	(IR DATA)			PCN 6 UMSP								
49	061024Z	24.9N 149.1E	SAT	(IR DATA)			PCN 6 UMSP								
50	061024Z	24.6N 149.0E	SAT	(IR DATA)			PCN 5 UMSP								
51	061026Z	24.5N 148.6E	SAT	(IR DATA)			PCN 6 NOAA-5								
52	061034Z	24.5N 149.2E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
53	061417Z	24.8N 148.8E	SAT	(IR DATA)			PCN 6 UMSP								
54	061418Z	25.3N 148.8E	SAT	(IR DATA)			PCN 5 UMSP								
55	061515Z	24.6N 148.0E	P	5 4	700	210 57 130 45	- - -	979	290	14 13	-	- -	-		9
56	061952Z	26.2N 148.3E	SAT	(IR DATA)			PCN 6 UMSP								
57	062133Z	25.6N 148.1E	SAT	(T4.0/4.0-/D0.5/25HRS)			PCN 4 UMSP								
58	062302Z	25.6N 148.1E	SAT	(T3.5/4.0 / / HRS)			PCN 1 NOAA-5								
59	062342Z	25.3N 148.2E	SAT	(IR DATA)			PCN 5 NOAA-4								
60	070018Z	26.4N 147.6E	SAT	(T5.0 /5.0- /D1.5 /27 HRS)			PCN 2 UMSP								
61	070119Z	26.5N 147.7E	SAT	(IR DATA)			PCN 1 UMSP								
62	070119Z	26.8N 147.6E	SAT	(T4.0/4.0 / / HRS)			PCN 3 UMSP								
63	070325Z	26.8N 147.5E	P	5 2	700	290 60 210 10	50 210 15	976	288	16 12	-	- -	-		10
64	070942Z	28.1N 147.4E	SAT	(IR DATA)			PCN 1 NOAA-5								
65	070952Z	27.6N 147.5E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
66	071014Z	28.2N 147.5E	SAT	(IR DATA)			PCN 1 NOAA-4								
67	071016Z	28.2N 147.3E	SAT	(IR DATA)			PCN 1 UMSP								
68	071400Z	29.0N 147.1E	SAT	(IR DATA)			PCN 1 UMSP								
69	071535Z	29.9N 146.9E	P	3 2	700	260 65 160 80	- - -	973	285	17 14	CIRC		35		11
70	072117Z	30.2N 147.8E	SAT	(T4.5/4.5-/D1.5 /22 HRS)			PCN 1 UMSP								
71	072218Z	30.1N 147.9E	SAT	(IR DATA)			PCN 3 NOAA-5								
72	080015Z	30.2N 148.0E	SAT	(IR DATA)			PCN 1 NOAA-5								
73	080100Z	30.7N 147.6E	SAT	(T5.0/5.0 / / HRS)			PCN 2 UMSP								
74	080101Z	31.4N 147.5E	SAT	(IR DATA)			PCN 1 UMSP								
75	080101Z	31.5N 147.3E	SAT	(T5.0/5.0-/D1.0/24HRS)			PCN 3 UMSP								
76	080325Z	31.3N 147.7E	P	3 5	700	280 65 210 130	- - -	968	281	14 12	ELIP	N-S	40X20		12
77	080858Z	32.9N 148.7E	SAT	(IR DATA)			PCN 5 NOAA-5								
78	080910Z	33.0N 149.2E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
79	080914Z	32.9N 148.8E	SAT	(IR DATA)			PCN 6 NOAA-4								
80	080959Z	33.0N 148.8E	SAT	(IR DATA)			PCN 5 UMSP								
81	080959Z	33.1N 149.3E	SAT	(IR DATA)			PCN 5 UMSP								
82	081054Z	33.2N 149.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
83	081343Z	33.6N 150.4E	SAT	(IR DATA)			PCN 6 UMSP								
84	082100Z	35.0N 151.1E	SAT	(T3.5/4.0 /W1.0/24HRS)			PCN 3 UMSP								
85	082100Z	35.0N 151.0E	SAT	(T5.0/5.0 / / HRS)			PCN 5 UMSP								
86	082318Z	35.3N 150.9E	SAT	(T3.0/4.0 / / HRS)			NOAA-5	(CONF 01)							
87	082331Z	35.5N 151.8E	SAT	(IR DATA)			PCN 5 NOAA-5								
88	090043Z	36.3N 151.5E	SAT	(IR DATA)			PCN 5 UMSP								
89	090942Z	38.9N 155.9E	SAT	(IR DATA)			PCN 5 UMSP								
90	091011Z	38.2N 154.8E	SAT	(IR DATA)			PCN 5 NOAA-5								

91	091325Z	41.3N 156.9E	SAT	(IR DATA)			PCN 5 UMSP								
92	092043Z	40.1N 160.1E	SAT	(IR DATA)			PCN 5 UMSP								
93	092233Z	41.2N 161.6E	SAT	(T1.5/1.5 /W1.5/24HRS)			NOAA-5	(CONF 01)							
94	092247Z	41.2N 161.0E	SAT	(T2.0/3.0 / / HRS)			PCN 5 NOAA-5								
95	100927Z	41.7N 168.6E	SAT	(IR DATA)			PCN 6 NOAA-5								

TROPICAL STORM HARRIET
FIX POSITIONS FOR CYCLONE NO. 16
0600Z 16 OCT TO 1800Z 20 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	132116Z	10.4N 150.9E	SAT	(T 0/ 0 / / HRS)			PCN 5 UMSP								
2	140057Z	10.8N 149.2E	SAT	(IR DATA)			PCN 5 UMSP								
3	140608Z	13.3N 137.1E	P	3 15	1500	200 28 100 55	20 80 150	1001	-	26 26	-	- -	-		1
4	140958Z	10.2N 147.3E	SAT	(IR DATA)			PCN 5 UMSP								
5	141023Z	10.4N 147.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
6	141339Z	10.4N 144.8E	SAT	(IR DATA)			PCN 5 UMSP								
7	142059Z	11.8N 142.6E	SAT	(T1.0/1.0+/D1.0/24HRS)			PCN 5 UMSP								
8	142300Z	12.2N 141.9E	SAT	(IR DATA)			PCN 5 NOAA-5								
9	142322Z	12.2N 142.0E	SAT	(IR DATA)			PCN 6 NOAA-4								
10	150221Z	13.0N 141.1E	SAT	(IR DATA)			PCN 5 UMSP								
11	150823Z	11.8N 133.9E	P	3 30	1500	90 30 360 100	25 360 100	1003	-	25 25	-	- -	-		2
12	151136Z	14.4N 140.4E	SAT	(IR DATA)			PCN 5 NOAA-5								
13	151503Z	14.7N 139.6E	SAT	(IR DATA)			PCN 6 UMSP								
14	152042Z	15.6N 138.8E	SAT	(IR DATA)			PCN 5 UMSP								
15	152223Z	15.4N 136.7E	SAT	(T2.0/2.0 /D1.0/25HRS)			PCN 5 UMSP								
16	160012Z	15.5N 136.5E	SAT	(IR DATA)			PCN 5 NOAA-5								
17	160203Z	15.9N 136.2E	SAT	(IR DATA)			PCN 5 UMSP								
18	160245Z	15.7N 135.8E	P	2 30	1500	120 52 - -	35 - -	999	-	25 25	-	- -	-		3
19	161052Z	16.6N 134.6E	SAT	(IR DATA)			PCN 5 NOAA-5								
20	161056Z	17.0N 135.0E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
21	161445Z	16.8N 133.7E	SAT	(IR DATA)			PCN 5 UMSP								
22	161510Z	15.9N 133.7E	P	5 30	700	190 28 110 90	- - -	-	309	10 10	-	- -	-		4
23	162206Z	17.4N 133.2E	SAT	(T2.0/2.0+/S /24HRS)			PCN 5 UMSP								
24	162206Z	17.8N 132.6E	SAT	(T3.5/3.5 / / HRS)			PCN 3 UMSP								
25	162206Z	17.2N 133.0E	SAT	(T2.5/2.5 / / HRS)			PCN 5 UMSP								
26	162206Z	17.2N 133.0E	SAT	(T3.0/3.0 / / HRS)			PCN 3 UMSP								
27	162328Z	17.7N 132.7E	SAT	(IR DATA)			PCN 5 NOAA-5								
28	170145Z	17.6N 132.1E	SAT	(IR DATA)			PCN 5 UMSP								
29	170145Z	17.4N 132.3E	SAT	(IR DATA)			PCN 5 UMSP								
30	170332Z	17.6N 132.1E	P	3 5	700	350 40 220 55	40 180 15	989	299	15 11	-	- -	-		5
31	171048Z	18.2N 131.5E	SAT	(IR DATA)			PCN 5 UMSP								
32	171049Z	18.1N 131.3E	SAT	(IR DATA)			PCN 5 UMSP								
33	171204Z	18.4N 131.4E	SAT	(IR DATA)			PCN 5 NOAA-5								
34	171209Z	18.7N 131.2E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
35	171427Z	18.2N 131.6E	SAT	(IR DATA)			PCN 5 UMSP								
36	171507Z	17.4N 131.8E	P	5 5	700	180 45 90 10	- - -	990	300	16 15	-	- -	-		6
37	172032Z	18.4N 132.6E	P	5 2	700	40 50 280 26	50 90 10	988	298	19 15	-	- -	-		6
38	172149Z	18.5N 132.0E	SAT	(T3.5/3.5 /D1.5/24HRS)			PCN 5 UMSP								
39	172149Z	18.5N 131.9E	SAT	(T4.5/4.5-/D1.0/24HRS)			PCN 3 UMSP								
40	180040Z	19.3N 132.7E	SAT	(IR DATA)			PCN 5 NOAA-5								
41	180309Z	19.5N 132.6E	SAT	(IR DATA)			PCN 5 UMSP								
42	180914Z	20.6N 132.5E	SAT	(IR DATA)			PCN 5 UMSP								
43	181031Z	20.7N 132.4E	SAT	(IR DATA)			PCN 5 UMSP								
44	181120Z	20.6N 132.9E	SAT	(IR DATA)			PCN 5 NOAA-5								
45	181411Z	21.1N 132.9E	SAT	(IR DATA)			PCN 5 UMSP								
46	181522Z	22.8N 133.4E	P	5 30	700	310 45 210 50	- - -	994	304	11 11	-	- -	-		8
47	182132Z	24.0N 134.2E	SAT	(T 4.0/4.0-/D0.5 /24 HRS)			PCN 5 UMSP								
48	182348Z	24.0N 134.9E	SAT	(T3.0/3.5 / / HRS)			NOAA-5	(CONF 02)							
49	182356Z	24.8N 135.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
50	190252Z	26.1N 135.8E	SAT	(IR DATA)			PCN 6 UMSP								
51	190350Z	26.3N 135.6E	P	10 15	700	230 50 190 30	45 210 70	985	295	12 12	-	- -	-		9
52	190945Z	28.0N 138.3E	SAT	(IR DATA)			PCN 5 NOAA-4								
53	191014Z	28.1N 138.2E	SAT	(IR DATA)			PCN 5 UMSP								
54	191036Z	28.2N 138.8E	SAT	(IR DATA)			PCN 5 NOAA-5								
55	191045Z	29.0N 137.8E	SAT	(IR DATA)			NOAA-5	(CONF 01)							
56	191352Z	28.5N 138.3E	SAT	(IR DATA)			PCN 5 UMSP								
57	191534Z	28.6N 138.0E	P	5 5	700	190 72 80 190	- - -	984	295	19 17	-	- -	-		10
58	192115Z	30.1N 140.0E	SAT	(T2.5/3.5 /W1.5/24HRS)			PCN 5 UMSP								
59	192115Z	29.5N 139.5E	SAT	(T2.5/2.5 / / HRS)			PCN 5 UMSP								
60	192312Z	30.3N 140.5E	SAT	(IR DATA)			PCN 5 NOAA-5								
61	200058Z	30.2N 141.0E	SAT	(T2.5/2.5 /W0.5/25HRS)			NOAA-5	(CONF 02)							
62	200313Z	29.5N 140.3E	P	3 5	700	220 60 90 80	50 220 60	990	300	13 10	-	- -	-		11
63	200952Z	29.6N 142.3E	SAT	(IR DATA)			PCN 5 NOAA-5								
64	200957Z	29.6N 142.4E	SAT	(IR DATA)			PCN 5 UMSP								
65	200957Z	31.0N 143.7E	SAT	(IR DATA)			PCN 5 UMSP								
66	201040Z	30.0N 142.4E	SAT	(IR DATA)			PCN 5 NOAA-4								
67	201334Z	30.6N 144.2E	SAT	(IR DATA)			PCN 6 UMSP								
68	201516Z	30.5N 144.3E	SAT	(IR DATA)			PCN 5 UMSP								

TYPHOON IVY
FIX POSITIONS FOR CYCLONE NO. 17
0600Z 21 OCT TO 0000Z 27 OCT

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV	ACCRY MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI	TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	191014Z	13.7N 146.1E	SAT	(IR DATA)							PCN 5 UMSP											
2	191036Z	13.8N 146.0E	SAT	(IR DATA)							PCN 5 UMSP											
3	192115Z	15.0N 146.5E	SAT	(T2.0/2.0 / / HRS)							PCN 5 UMSP											
4	192306Z	16.1N 148.0E	SAT	(T1.5/1.5 / / HRS)							NOAA-5			(CONF 01)								
5	192312Z	15.1N 146.4E	SAT	(IR DATA)							PCN 5 UMSP											
6	200053Z	15.8N 146.6E	SAT	(IR DATA)							PCN 5 UMSP											
7	200952Z	17.8N 147.5E	SAT	(IR DATA)							PCN 5 UMSP											
8	200957Z	17.0N 147.5E	SAT	(IR DATA)							NOAA-5			(CONF 01)								
9	200957Z	17.7N 147.7E	SAT	(IR DATA)							PCN 5 UMSP											
10	201334Z	18.8N 146.8E	SAT	(IR DATA)							PCN 6 UMSP											
11	201334Z	17.7N 146.2E	SAT	(IR DATA)							PCN 6 UMSP											
12	202058Z	18.5N 147.1E	SAT	(T2.0/2.0 /S /24HRS)							PCN 5 UMSP											
13	202221Z	17.1N 146.0E	SAT	(T2.0/2.0 /D0.5/23HRS)							NOAA-5			(CONF 01)								
14	202228Z	18.5N 147.2E	SAT	(IR DATA)							PCN 5 UMSP											
15	210219Z	16.5N 147.2E	P	5	5	1500	110	32	30	90	25	30	90	988	-	25	25	-	- -	-		1
16	210328Z	16.2N 147.4E	P	3	15	700	-	-	-	-	-	-	-	996	305	12	13	-	- -	-		1
17	210940Z	17.0N 147.8E	SAT	(IR DATA)							PCN 5 UMSP											
18	210940Z	16.4N 147.7E	SAT	(IR DATA)							PCN 6 UMSP											
19	211105Z	17.4N 147.5E	SAT	(IR DATA)							PCN 5 UMSP											
20	211110Z	16.7N 147.6E	SAT	(IR DATA)							NOAA-5			(CONF 03)								
21	211545Z	17.0N 147.0E	P	3	20	700	140	38	40	55	-	-	-	996	305	12	12	-	- -	-		2
22	212041Z	17.8N 146.8E	SAT	(T2.0/2.0 /S /24HRS)							PCN 5 UMSP											
23	212041Z	17.6N 146.8E	SAT	(T2.0/2.0 / / HRS)							PCN 6 UMSP											
24	212207Z	17.9N 146.9E	SAT	(IR DATA)							PCN 6 UMSP											
25	212334Z	17.1N 145.7E	SAT	(T2.5/2.5 /D0.5/25HRS)							NOAA-5			(CONF 01)								
26	212341Z	17.9N 146.4E	SAT	(IR DATA)							PCN 5 UMSP											
27	220250Z	17.3N 145.5E	P	5	20	700	20	20	30	20	40	150	120	989	300	11	12	-	- -	-		3
28	220922Z	16.6N 144.9E	SAT	(IR DATA)							PCN 6 UMSP											
29	220923Z	17.2N 144.8E	SAT	(IR DATA)							PCN 5 UMSP											
30	221016Z	16.8N 145.0E	SAT	(IR DATA)							NOAA-5			(CONF 01)								
31	221021Z	17.1N 144.9E	SAT	(IR DATA)							PCN 6 UMSP											
32	221557Z	17.0N 146.1E	P	2	5	700	290	45	220	180	-	-	-	982	293	12	12	-	- -	-		4
33	222023Z	17.2N 146.3E	SAT	(T3.5/3.5 /D1.5/24HRS)							PCN 6 UMSP											
34	222024Z	17.7N 146.4E	SAT	(T3.5/3.5 /D1.5/24HRS)							PCN 6 UMSP											
35	222045Z	17.5N 146.5E	P	5	5	700	10	48	280	15	-	-	-	980	292	15	15	-	- -	-		4
36	222248Z	17.9N 147.6E	SAT	(T4.0/4.0 /D1.5/23HRS)							NOAA-5			(CONF 01)								
37	222257Z	17.8N 146.5E	SAT	(IR DATA)							PCN 5 UMSP											
38	230905Z	18.6N 147.8E	SAT	(IR DATA)							PCN 4 UMSP											
39	230906Z	18.6N 147.9E	SAT	(IR DATA)							PCN 6 UMSP											
40	230937Z	18.6N 147.8E	SAT	(IR DATA)							PCN 6 UMSP											
41	230942Z	18.6N 148.6E	SAT	(IR DATA)							NOAA-5			(CONF 01)								
42	232006Z	21.1N 149.6E	SAT	(T4.5/4.5 /D1.0/24HRS)							PCN 2 UMSP											
43	232006Z	20.8N 150.0E	SAT	(IR DATA)							PCN 6 UMSP											
44	232213Z	21.2N 150.0E	SAT	(IR DATA)							PCN 6 UMSP											
45	240341Z	21.5N 151.2E	P	10	20	700	320	75	240	60	35	220	100	967	280	16	12	CIRC		30		7
46	240848Z	22.9N 152.1E	SAT	(IR DATA)							PCN 6 UMSP											
47	240849Z	22.6N 152.0E	SAT	(IR DATA)							PCN 4 UMSP											
48	241044Z	23.0N 152.4E	SAT	(IR DATA)							PCN 4 UMSP											
49	241056Z	23.0N 152.5E	SAT	(IR DATA)							NOAA-5			(CONF 01)								
50	241508Z	24.2N 153.7E	P	5	2	700	280	93	200	60	-	-	-	962	276	20	12	CIRC		50		8
51	241949Z	24.8N 153.8E	SAT	(T5.0/5.0 /D0.5/24HRS)							PCN 3 UMSP											
52	241949Z	24.6N 153.6E	SAT	(IR DATA)							PCN 2 UMSP											
53	242257Z	25.2N 154.5E	SAT	(IR DATA)							PCN 1 UMSP											
54	242315Z	25.4N 154.5E	SAT	(T5.0/5.0 / / HRS)							NOAA-5			(CONF 01)								
55	242325Z	25.1N 154.4E	SAT	(IR DATA)							PCN 1 UMSP											
56	250106Z	26.0N 154.6E	SAT	(IR DATA)							PCN 1 UMSP											
57	250106Z	25.3N 154.6E	SAT	(T4.5/4.5 / / HRS)							PCN 2 UMSP											
58	250233Z	25.8N 154.4E	P	3	2	700	290	90	180	10	80	90	15	945	261	21	11	CIRC		30		9
59	250831Z	27.5N 154.9E	SAT	(IR DATA)							PCN 2 UMSP											
60	250832Z	26.7N 155.0E	SAT	(IR DATA)							PCN 2 UMSP											
61	251005Z	27.0N 155.5E	SAT	(IR DATA)							PCN 1 UMSP											
62	251013Z	26.6N 155.5E	SAT	(IR DATA)							NOAA-5			(CONF 01)								
63	251327Z	27.4N 155.8E	SAT	(IR DATA)							PCN 2 UMSP											
64	251348Z	27.2N 155.8E	SAT	(IR DATA)							PCN 2 UMSP											
65	251932Z	28.6N 155.9E	SAT	(IR DATA)							PCN 2 UMSP											
66	251932Z	28.0N 156.2E	SAT	(IR DATA)							PCN 2 UMSP											
67	252157Z	28.7N 156.2E	SAT	(IR DATA)							PCN 2 UMSP											
68	252230Z	28.7N 156.1E	SAT	(T5.0/5.0 /S /23HRS)							NOAA-5			(CONF 01)								
69	252241Z	28.7N 156.4E	SAT	(T4.5/5.0 / / HRS)							PCN 1 UMSP											
70	260048Z	29.2N 156.5E	SAT	(IR DATA)							PCN 2 UMSP											
71	260048Z	29.4N 156.6E	SAT	(T4.0/4.5-/W0.5/24HRS)							PCN 2 UMSP											
72	260814Z	31.5N 157.4E	SAT	(IR DATA)							PCN 2 UMSP											
73	260830Z	30.0N 157.2E	SAT	(IR DATA)							PCN 6 UMSP											
74	260921Z	31.0N 158.2E	SAT	(IR DATA)							PCN 5 UMSP											
75	260931Z	31.0N 159.0E	SAT	(IR DATA)							NOAA-5			(CONF 01)								
76	260956Z	30.9N 158.1E	SAT	(IR DATA)							PCN 5 UMSP											
77	261330Z	32.0N 161.1E	SAT	(IR DATA)							PCN 6 UMSP											
78	262157Z	37.2N 164.5E	SAT	(T3.0/3.5 /W1.5/23HRS)							PCN 5 UMSP											
79	262253Z	38.7N 164.4E	SAT	(IR DATA)							PCN 6 UMSP											

TYPHOON JEAN
FIX POSITIONS FOR CYCLONE NO. 18
1200Z 28 OCT TO 1200Z 03 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	242128Z	7.3N 171.9E	SAT	(T 0/ 0 / / HRS)						PCN 5 DMSP										
2	252157Z	12.2N 165.9E	SAT	(T 0/ 0 /S /24HRS)						PCN 6 DMSP										
3	262157Z	13.6N 163.7E	SAT	(T 0/ 0 /S /24HRS)						PCN 5 DMSP										
4	270031Z	15.8N 160.3E	SAT	(IR DATA)						PCN 6 DMSP										
5	272302Z	17.8N 159.1E	SAT	(T1.5/1.5 / / HRS)						NOAA-5			(CONF 01)							
6	272317Z	17.5N 159.5E	SAT	(T1.0/1.0 /D1.0/25HRS)						PCN 5 DMSP										
7	280921Z	19.1N 157.4E	SAT	(IR DATA)						PCN 5 DMSP										
8	280921Z	20.0N 156.3E	SAT	(IR DATA)						PCN 6 DMSP										
9	280950Z	19.1N 157.0E	SAT	(IR DATA)						PCN 5 DMSP										
10	280956Z	18.6N 157.0E	SAT	(IR DATA)						NOAA-5			(CONF 01)							
11	281254Z	19.6N 156.9E	SAT	(IR DATA)						PCN 5 DMSP										
12	282022Z	20.0N 156.3E	SAT	(T3.0/3.0 / / HRS)						PCN 4 DMSP										
13	282023Z	20.1N 156.6E	SAT	(T3.0/3.0 / / HRS)						PCN 3 DMSP										
14	282218Z	20.1N 156.1E	SAT	(T3.0/3.0 /D1.5/23HRS)						NOAA-5			(CONF 01)							
15	282226Z	20.0N 156.3E	SAT	(IR DATA)						PCN 6 DMSP										
16	282248Z	20.1N 156.3E	SAT	(IR DATA)						PCN 6 DMSP										
17	290513Z	20.8N 156.1E	P	2 5	1500	300	70	210	25	65	300	70	980	-	25 24	CIRC		30		1
18	290904Z	20.8N 156.5E	SAT	(IR DATA)						PCN 6 DMSP										
19	290905Z	20.9N 156.3E	SAT	(IR DATA)						PCN 5 DMSP										
20	290906Z	20.7N 156.2E	SAT	(IR DATA)						PCN 6 DMSP										
21	290912Z	20.7N 156.0E	SAT	(IR DATA)						NOAA-5			(CONF 01)							
22	291237Z	21.5N 156.7E	SAT	(IR DATA)						PCN 6 DMSP										
23	291237Z	21.4N 156.4E	SAT	(IR DATA)						PCN 6 DMSP										
24	291451Z	21.7N 156.9E	P	5 10	700	240	72	150	15	-	-	-	972	284	16 13	CIRC		30		2
25	292005Z	22.7N 157.5E	SAT	(T3.5/3.5 /D0.5/24HRS)						PCN 5 DMSP										
26	292005Z	22.8N 157.4E	SAT	(T3.0/3.0 /S /24HRS)						PCN 4 DMSP										
27	292142Z	22.9N 157.6E	SAT	(IR DATA)						PCN 5 DMSP										
28	292328Z	24.1N 157.3E	SAT	(T4.0/4.0 /D1.0/25HRS)						NOAA-5			(CONF 01)							
29	300119Z	23.2N 158.2E	SAT	(IR DATA)						PCN 6 DMSP										
30	300307Z	23.2N 157.3E	P	2 5	700	240	70	220	50	65	220	45	978	290	18 10	-	- -	-		3
31	300847Z	24.5N 158.4E	SAT	(IR DATA)						PCN 6 DMSP										
32	300848Z	24.3N 158.5E	SAT	(IR DATA)						PCN 5 DMSP										
33	301018Z	24.2N 158.4E	SAT	(IR DATA)						PCN 6 DMSP										
34	301026Z	24.5N 159.0E	SAT	(IR DATA)						NOAA-5			(NO CONF)							
35	301401Z	23.5N 157.8E	SAT	(IR DATA)						PCN 5 DMSP										
36	301401Z	25.5N 159.2E	SAT	(IR DATA)						PCN 6 DMSP										
37	301948Z	24.0N 157.1E	SAT	(T1.0/2.0 /W2.5/24HRS)						PCN 3 DMSP										
38	301948Z	23.8N 157.2E	SAT	(T2.0/3.0-/W1.0/24HRS)						PCN 4 DMSP										
39	302254Z	24.0N 156.5E	SAT	(IR DATA)						PCN 4 DMSP										
40	302345Z	23.8N 156.5E	SAT	(T2.0/3.0 /W2.0/24HRS)						NOAA-5			(CONF 01)							
41	310102Z	24.2N 156.1E	SAT	(IR DATA)						PCN 3 DMSP										
42	310102Z	24.2N 155.9E	SAT	(T2.5/2.5-/ / HRS)						PCN 4 DMSP										
43	310830Z	24.8N 154.3E	SAT	(IR DATA)						PCN 4 DMSP										
44	310830Z	24.8N 154.4E	SAT	(IR DATA)						PCN 4 DMSP										
45	310934Z	24.9N 154.0E	SAT	(IR DATA)						PCN 6 DMSP										
46	310943Z	26.3N 153.7E	SAT	(IR DATA)						NOAA-5			(CONF 02)							
47	311344Z	25.1N 153.0E	SAT	(IR DATA)						PCN 6 DMSP										
48	312112Z	25.4N 149.8E	SAT	(T2.5/2.5 / / HRS)						PCN 3 DMSP										
49	312113Z	25.8N 150.4E	SAT	(T 0/1.0 /W1.0/25HRS)						PCN 3 DMSP										
50	312357Z	26.1N 149.3E	SAT	(T2.0/2.0 /S /24HRS)						NOAA-5			(CONF 01)							
51	010859Z	25.5N 147.0E	SAT	(IR DATA)						NOAA-5			(CONF 01)							
52	011046Z	26.3N 146.3E	SAT	(IR DATA)						PCN 4 DMSP										
53	012056Z	26.6N 145.9E	SAT	(T3.5/3.5 /D1.0/24HRS)						PCN 1 DMSP										
54	012323Z	26.5N 146.1E	SAT	(T2.0/2.0 / / HRS)						PCN 3 DMSP										
55	020208Z	26.9N 146.1E	SAT	(IR DATA)						PCN 5 DMSP										
56	020937Z	27.3N 146.6E	SAT	(IR DATA)						PCN 6 DMSP										
57	020938Z	26.9N 146.9E	SAT	(IR DATA)						PCN 5 DMSP										
58	021002Z	27.0N 146.4E	SAT	(IR DATA)						PCN 5 DMSP										
59	021012Z	26.0N 147.0E	SAT	(IR DATA)						NOAA-5			(CONF 02)							
60	021450Z	27.0N 146.6E	SAT	(IR DATA)						PCN 6 DMSP										
61	021450Z	26.4N 146.9E	SAT	(IR DATA)						PCN 3 DMSP										
62	022039Z	27.5N 146.2E	SAT	(T1.0/2.0 /W1.0/21HRS)						PCN 4 DMSP										
63	022039Z	27.1N 146.1E	SAT	(IR DATA)						PCN 3 DMSP										
64	022239Z	27.8N 146.4E	SAT	(IR DATA)						PCN 3 DMSP										
65	022333Z	27.3N 146.6E	SAT	(IR DATA)						PCN 3 DMSP										
66	030025Z	27.0N 147.0E	SAT							NOAA-5			(CONF 01)							
67	030151Z	26.9N 146.5E	SAT	(IR DATA)						PCN 3 DMSP										
68	030918Z	26.1N 146.1E	SAT	(IR DATA)						PCN 3 DMSP										
69	030920Z	26.1N 145.6E	SAT	(IR DATA)						PCN 6 DMSP										
70	030921Z	26.1N 146.1E	SAT	(IR DATA)						PCN 3 DMSP										
71	032351Z	24.0N 143.5E	SAT	(IR DATA)						PCN 3 DMSP										
72	041031Z	24.1N 141.3E	SAT	(IR DATA)						PCN 3 DMSP										
73	042307Z	23.6N 139.2E	SAT	(IR DATA)						PCN 3 DMSP										
74	060019Z	23.2N 134.5E	SAT	(IR DATA)						PCN 3 DMSP										

TYPHOON KIM
FIX POSITIONS FOR CYCLONE NO. 19
0600Z 06 NOV TO 0000Z 17 NOV

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	032155Z	7.2N 156.1E	SAT	(T 0/ 0 / / HRS) PCN 5 NOAA-5											
2	040904Z	8.4N 154.5E	SAT	(IR DATA) PCN 6 DMSP											
3	041031Z	8.8N 153.8E	SAT	(IR DATA) PCN 5 NOAA-5											
4	041415Z	9.2N 153.2E	SAT	(IR DATA) PCN 5 DMSP											
5	042004Z	10.1N 152.1E	SAT	(T2.0/2.0 / / HRS) PCN 6 DMSP											
6	042133Z	10.3N 151.8E	SAT	(IR DATA) PCN 6 NOAA-4											
7	042250Z	9.4N 153.1E	P	5 12	1500	300 38 230 25	20 240 20	1007	-	22 22	-	- -	-		2
8	042309Z	9.5N 153.1E	SAT	(IR DATA) PCN 5 NOAA-5											
9	050115Z	9.9N 152.5E	SAT	(IR DATA) PCN 5 DMSP											
10	050846Z	11.0N 152.9E	SAT	(IR DATA) PCN 6 DMSP											
11	050947Z	11.0N 152.6E	SAT	(IR DATA) PCN 6 NOAA-5											
12	051357Z	11.2N 152.4E	SAT	(IR DATA) PCN 5 DMSP											
13	052120Z	10.5N 153.9E	SAT	(T2.0/2.0 / / HRS) PCN 6 NOAA-5											
14	052219Z	11.7N 154.6E	SAT	(T1.0/1.0 / / HRS) NOAA-5 (CONF 02)											
15	060041Z	10.2N 153.8E	P	5 20	1500	260 25 180 50	25 180 50	1004	-	24 25	-	- -	-		3
16	060058Z	10.6N 153.3E	SAT	(IR DATA) PCN 5 DMSP											
17	060310Z	10.8N 153.1E	P	5 40	700	210 28 130 120	25 180 50	998	307	11 10	-	- -	-		3
18	060829Z	11.2N 153.1E	SAT	(IR DATA) PCN 6 DMSP											
19	060829Z	11.4N 152.4E	SAT	(IR DATA) PCN 6 DMSP											
20	061030Z	11.3N 152.0E	SAT	(IR DATA) PCN 5 NOAA-5											
21	061102Z	11.9N 152.0E	SAT	(IR DATA) NOAA-5 (CONF 02)											
22	061339Z	11.8N 151.5E	SAT	(IR DATA) PCN 5 DMSP											
23	061510Z	11.4N 151.7E	P	10 5	700	110 50 50 25	- - -	994	304	10 11	ELIP	N-S	15X10		4
24	062036Z	11.5N 151.8E	P	8 2	700	120 30 60 50	35 360 10	992	302	18 12	-	- -	-		4
25	062112Z	12.0N 150.8E	SAT	(T3.0/3.0 / / HRS) PCN 5 DMSP											
26	062330Z	12.0N 150.5E	SAT	(T3.0/3.0 /D2.0/25HRS) NOAA-5 (CONF 01)											
27	062335Z	12.0N 150.4E	SAT	(IR DATA) PCN 5 NOAA-5											
28	070040Z	12.2N 150.1E	SAT	(IR DATA) PCN 5 DMSP											
29	070258Z	12.4N 150.4E	P	5 5	700	360 25 290 30	25 290 30	995	305	18 13	CIRC		20		5
30	070932Z	12.8N 149.4E	P	3 5	700	80 35 30 25	- - -	992	302	17 12	-	- -	-		5
31	070954Z	12.8N 149.6E	SAT	(IR DATA) PCN 5 DMSP											
32	071015Z	12.8N 149.2E	SAT	(IR DATA) PCN 5 NOAA-5											
33	071322Z	13.0N 148.8E	SAT	(IR DATA) PCN 5 DMSP											
34	071508Z	12.7N 148.9E	P	15 10	700	40 40 280 125	- - -	995	309	14 11	-	- -	-		6
35	072055Z	13.1N 147.6E	SAT	(T4.0/4.0 /D1.0/24HRS) PCN 5 DMSP											
36	072114Z	13.0N 147.8E	P	14 13	700	10 40 330 20	- - -	980	291	14 13	-	- -	-		7
37	072247Z	12.9N 147.6E	SAT	(T3.0/3.0 /S /23HRS) NOAA-5 (CONF 01)											
38	072251Z	13.2N 147.5E	SAT	(IR DATA) PCN 6 NOAA-5											
39	080010Z	13.2N 146.9E	LRDR	- PSBL CENT POOR FIX							-	- -	-	13.6N 144.9E	-
40	080035Z	13.3N 147.0E	LRDR	- PSBL CENT POOR FIX							-	- -	-	13.6N 144.9E	-
41	080110Z	13.3N 146.7E	LRDR	- 10° SPIRAL OVERLAY EYE FAIR FIX 70% WALL CLD CIRC D25 MVMT 270/13 WALL CLD OPEN SE									-	13.6N 144.9E	-
42	080135Z	13.3N 146.5E	LRDR	- EYE 10° SPRL GOOD FIX CIRC D20 80% WALL CLD							-	- -	-	13.6N 144.9E	-
43	080203Z	13.0N 147.1E	SAT	(T4.0/4.0 / / HRS) PCN 6 DMSP											
44	080204Z	13.3N 147.0E	SAT	(IR DATA) PCN 5 DMSP											
45	080204Z	13.3N 147.6E	SAT	(T4.0/4.0 / / HRS) PCN 1 DMSP											
46	080210Z	13.3N 146.5E	LRDR	- EYE 10 DEG SPRL FAIR FIX CIRC D20 80% WALL CLD							-	- -	-	13.6N 144.9E	-
47	080235Z	13.3N 146.4E	LRDR	- EYE 10 DEG SPRL FAIR FIX CIRC D20 80% WALL CLD							-	- -	-	13.6N 144.9E	-
48	080254Z	13.2N 146.5E	P	2 3	700	20 33 250 70	45 270 50	981	292	12 11	-	- -	-		8
49	080310Z	13.3N 146.3E	LRDR	- EYE 10 DEG SPRL FAIR FIX CIRC D20 70% WALL CLD							-	- -	-	13.6N 144.9E	-
50	080335Z	13.3N 146.2E	LRDR	- EYE 12° SPRL FAIR FIX CIRC D15 80% WALL CLD							-	- -	-	13.6N 144.9E	-
51	080410Z	13.3N 146.1E	LRDR	- EYE 10° SPRL FAIR FIX CIRC D15 70% WALL CLD							-	- -	-	13.6N 144.9E	-
52	080435Z	13.3N 146.0E	LRDR	- EYE 15° SPRL FAIR FIX CIRC D20 60% WALL CLD							-	- -	-	13.6N 144.9E	-
53	080510Z	13.2N 146.0E	LRDR	- EYE 10° SPRL GOOD FIX CIRC D12 80% WALL CLD							-	- -	-	13.6N 144.9E	-
54	080535Z	13.2N 145.8E	LRDR	- EYE 15° SPRL FAIR FIX CIRC D10 70% WALL CLD							-	- -	-	13.6N 144.9E	-
55	080610Z	13.2N 145.8E	LRDR	- EYE 10° SPRL FAIR FIX CIRC D10 100% WALL CLD							-	- -	-	13.6N 144.9E	-
56	080635Z	13.2N 145.7E	LRDR	- EYE 10° SPRL GOOD FIX CIRC D13 90% WALL CLD							-	- -	-	13.6N 144.9E	-
57	080710Z	13.2N 145.5E	LRDR	- EYE 10° SPRL FAIR FIX CIRC D15 70% WALL CLD							-	- -	-	13.6N 144.9E	-
58	080735Z	13.2N 145.5E	LRDR	- EYE 10° SPRL FAIR FIX CIRC D15 70% WALL CLD							-	- -	-	13.6N 144.9E	-
59	080810Z	13.3N 145.5E	LRDR	- EYE 10° SPRL GOOD FIX CIRC D15							-	- -	-	13.6N 144.9E	-
60	080831Z	13.3N 145.3E	P	2 3	700	270 44 140 30	- - -	977	289	14 11	-	- -	-		8
61	080835Z	13.4N 145.4E	LRDR	- EYE 10° SPRL GOOD FIX CIRC D10							-	- -	-	13.6N 144.9E	-
62	080910Z	13.4N 145.3E	LRDR	- EYE 10° SPRL GOOD FIX CIRC D10							-	- -	-	13.6N 144.9E	-
63	080935Z	13.5N 145.3E	LRDR	- EYE 10° SPRL GOOD FIX CIRC D12							-	- -	-	13.6N 144.9E	-
64	080937Z	13.4N 145.3E	SAT	(IR DATA) PCN 3 DMSP											
65	081035Z	13.5N 144.9E	LRDR	- EYE GOOD FIX CIRC D18 80% WALL CLD EYE OVER N PORT GUAM							-	- -	-	13.6N 144.9E	-
66	081108Z	13.5N 144.8E	LRDR	- EYE GOOD FIX CIRC D18 90% WALL CLD EYE CENTER OVER GUAM							-	- -	-	13.6N 144.9E	-
67	081128Z	13.5N 144.7E	SAT	(IR DATA) NOAA-5											
68	081130Z	13.3N 144.9E	SAT	(IR DATA) NOAA-5 (CONF 01)											
69	081135Z	13.5N 144.8E	LRDR	- EYE 10° SPRL OVRLAY FAIR FIX							-	- -	-	13.6N 144.9E	-
70	081208Z	13.6N 144.8E	LRDR	- EYE GOOD FIX D22 80% WALL CLD							-	- -	-	13.6N 144.9E	-
71	081235Z	13.6N 144.6E	LRDR	- EYE GOOD FIX CIRC D20 60% WALL CLD OPEN NW							-	- -	-	13.6N 144.9E	-
72	081308Z	13.7N 144.4E	LRDR	- EYE GOOD FIX ELIP AXIS 25/15 60% WALL CLD OPEN SE							-	- -	-	13.6N 144.9E	-
73	081335Z	13.7N 144.3E	LRDR	- EYE GOOD FIX CIRC D22 70% WALL CLD OPEN E							-	- -	-	13.6N 144.9E	-
74	081410Z	13.7N 144.0E	LRDR	- EYE GOOD FIX CIRC D18 70% WALL CLD OPEN E							-	- -	-	13.6N 144.9E	-
75	081446Z	13.6N 143.9E	SAT	(IR DATA) PCN 5 DMSP											
76	081535Z	13.7N 143.7E	LRDR	- EYE GOOD FIX ELIP 25/18 80% WALL CLD							-	- -	-	13.6N 144.9E	-
77	081635Z	13.8N 143.3E	LRDR	- EYE GOOD FIX ELIP AXIS 30/20 60% WALL CLD							-	- -	-	13.6N 144.9E	-
78	081735Z	13.7N 143.1E	LRDR	- EYE GOOD FIX ELIP AXIS 25/15 70% WALL CLD							-	- -	-	13.6N 144.9E	-
79	081910Z	13.8N 142.8E	LRDR	- EYE GOOD FIX ELIP AXIS 25/17 70% WALL CLD							-	- -	-	13.6N 144.9E	-
80	081935Z	13.8N 142.7E	LRDR	- EYE GOOD FIX ELIP AXIS 25/15 70% WALL CLD							-	- -	-	13.6N 144.9E	-
81	082035Z	13.8N 142.5E	LRDR	- EYE FAIR FIX D20 40% WALL CLD							-	- -	-	13.6N 144.9E	-
82	082038Z	13.9N 142.3E	SAT	(T5.0/5.0 /D1.0/24HRS) PCN 1 DMSP											
83	082210Z	13.9N 142.2E	LRDR	- EYE FAIR FIX CIRC D20 40% WALL CLD							-	- -	-	13.6N 144.9E	-
84	082235Z	14.0N 142.0E	LRDR	- EYE FAIR FIX CIRC D20 50% WALL CLD							-	- -	-	13.6N 144.9E	-
85	082318Z	14.0N 141.8E	SAT	(IR DATA) PCN 1 NOAA-4											
86	082358Z	14.3N 142.3E	SAT	(T4.5/4.5 /D1.5/25HRS) NOAA-5 (CONF 01)											
87	090004Z	14.0N 141.6E	SAT	(IR DATA) PCN 1 NOAA-5											
88	090146Z	14.0N 141.2E	SAT	(T5.0/5.0 / / HRS) PCN 1 DMSP											
89	090146Z	14.0N 141.3E	SAT	(T5.0/5.0 /D1.0/24HRS) PCN 1 DMSP											
90	090238Z	14.2N 140.9E	P	2 5	700	180 91 120 10	110 360 8	939	256	18 13	CIRC		8		10

91	090919Z	14.2N	139.9E	SAT	(IR DATA)			PCN 6 DMSP									
92	090920Z	14.4N	138.7E	SAT	(IR DATA)			PCN 6 DMSP									
93	091044Z	14.6N	138.8E	SAT	(IR DATA)			PCN 1 NOAA-5									
94	091048Z	13.7N	138.9E	SAT	(IR DATA)			NOAA-5	(CONF 02)								
95	091428Z	14.8N	137.8E	SAT	(IR DATA)			PCN 1 DMSP									
96	091428Z	14.8N	137.9E	SAT	(IR DATA)			PCN 1 DMSP									
97	091435Z	13.8N	143.9E	P	2 5	700	10 54 280	28 - -	-	972	284	16 11	CIRC		23		9
98	092202Z	15.2N	136.0E	SAT	(T6.0/6.0 /D1.0/25HRS)			PCN 1 DMSP									
99	092202Z	15.1N	135.8E	SAT	(T6.0/6.0 /D1.0/20HRS)			PCN 1 DMSP									
100	092320Z	15.0N	135.7E	SAT	(IR DATA)			PCN 1 NOAA-5									
101	100013Z	14.9N	135.4E	SAT	(IR DATA)			PCN 1 NOAA-4									
102	100110Z	14.5N	135.2E	SAT	(T6.0/6.0 /D1.5/25HRS)			NOAA-5	(CONF 02)								
103	100129Z	14.9N	135.4E	SAT	(IR DATA)			PCN 1 DMSP									
104	100310Z	15.2N	134.7E	SAT	(IR DATA)			PCN 1 DMSP									
105	100328Z	14.8N	134.5E	P	2 3	700	50 110 290	24 120 290	25	929	247	18 15	CIRC		30		11
106	101044Z	14.8N	133.4E	SAT	(IR DATA)			PCN 1 DMSP									
107	101044Z	14.9N	133.6E	SAT	(IR DATA)			PCN 1 DMSP									
108	101044Z	14.8N	133.6E	SAT	(IR DATA)			PCN 1 DMSP									
109	101156Z	14.9N	133.1E	SAT	(IR DATA)			PCN 1 NOAA-5									
110	101200Z	14.8N	132.9E	SAT	(IR DATA)			NOAA-5	(CONF 01)								
111	101410Z	15.0N	132.7E	SAT	(IR DATA)			PCN 1 DMSP									
112	101520Z	14.5N	132.7E	P	5 5	700	320 95 290	20 - -	-	919	238	17 15	ELIP	N-S	40X30		12
113	102145Z	14.7N	131.7E	SAT	(T6.5/6.5 /D0.5/24HRS)			PCN 1 DMSP									
114	102145Z	14.7N	131.5E	SAT	(T6.5/6.5-/D0.5/24HRS)			PCN 1 DMSP									
115	102313Z	14.8N	131.6E	SAT	(IR DATA)			PCN 1 NOAA-4									
116	110026Z	14.9N	131.5E	SAT	(T6.5/6.5 /D0.5/23HRS)			NOAA-5	(CONF 02)								
117	110032Z	14.8N	131.5E	SAT	(IR DATA)			PCN 1 NOAA-5									
118	110253Z	14.8N	131.2E	SAT	(IR DATA)			PCN 1 DMSP									
119	110253Z	14.8N	131.0E	SAT	(IR DATA)			PCN 1 DMSP									
120	110345Z	14.7N	131.1E	P	5 5	700	50 105 310	40 45 320	150	925	249	16 13	ELIP	N-S	35X30		13
121	111027Z	14.7N	130.3E	SAT	(IR DATA)			PCN 1 DMSP									
122	111027Z	14.8N	130.3E	SAT	(IR DATA)			PCN 1 DMSP									
123	111112Z	14.7N	130.1E	SAT	(IR DATA)			PCN 1 NOAA-5									
124	111116Z	14.8N	129.8E	SAT	(IR DATA)			NOAA-5	(CONF 01)								
125	111510Z	14.6N	130.0E	P	2 2	700	350 93 260	70 - -	-	939	256	16 13	ELIP	E-W	35X15		14
126	111534Z	14.7N	129.8E	SAT	(IR DATA)			PCN 1 DMSP									
127	111534Z	14.5N	129.7E	SAT	(IR DATA)			PCN 1 DMSP									
128	112053Z	14.6N	129.4E	P	2 2	700	20 92 260	30 - -	-	940	256	17 12	ELIP	SW-NE	25X20		14
129	112128Z	14.7N	128.8E	SAT	(IR DATA)			PCN 1 DMSP									
130	112128Z	14.9N	128.8E	SAT	(T5.5/6.5 /W1.0/24HRS)			PCN 1 DMSP									
131	112310Z	14.4N	128.9E	SAT	(T5.0/6.0 /W1.5/25HRS)			PCN 3 DMSP									
132	112342Z	14.8N	129.2E	SAT	(T5.5/6.0 /W1.0/23HRS)			NOAA-5	(CONF 01)								
133	112348Z	14.7N	129.1E	SAT	(T5.0/6.0 / / HRS)			PCN 3 NOAA-5									
134	120008Z	14.8N	128.8E	SAT	(IR DATA)			NOAA-4									
135	120235Z	14.7N	128.5E	SAT	(IR DATA)			PCN 1 DMSP									
136	120235Z	14.8N	128.4E	SAT	(T5.0/5.0 / / HRS)			PCN 3 DMSP									
137	120235Z	14.6N	128.6E	SAT	(IR DATA)			PCN 1 DMSP									
138	120300Z	14.6N	128.5E	P	3 5	700	40 90 320	40 110 20	12	940	257	17 15	CIRC		20		15
139	120831Z	14.5N	127.9E	P	3 5	700	130 95 50	70 90 40	40	940	257	17 15	-	- -	-		15
140	121010Z	14.8N	127.4E	SAT	(IR DATA)			PCN 3 DMSP									
141	121224Z	14.7N	127.1E	SAT	(IR DATA)			PCN 3 NOAA-5									
142	121230Z	14.4N	127.0E	SAT	(IR DATA)			NOAA-5	(CONF 01)								
143	121516Z	14.6N	126.7E	SAT	(IR DATA)			PCN 3 DMSP									
144	121517Z	14.5N	126.7E	SAT	(IR DATA)			PCN 3 DMSP									
145	121542Z	14.4N	126.6E	P	5 5	700	110 100 340	93 - -	-	939	255	16 13	CIRC		13		16
146	122030Z	14.3N	126.0E	P	5 5	700	70 35 340	10 - -	-	932	250	19 16	CIRC		15		16
147	122252Z	14.6N	125.6E	SAT	(T5.0/5.0 / / HRS)			PCN 1 DMSP									
148	122252Z	14.5N	125.7E	SAT	(T5.0/5.0 /S /23HRS)			PCN 1 DMSP									
149	122300Z	14.8N	125.6E	LRDR	- 2070/								-	- -	-	14.1N 123.0E	-
150	130054Z	14.9N	125.5E	SAT	(T5.0/5.5 /W0.5/25HRS)			NOAA-5	(CONF 01)								
151	130100Z	14.8N	124.1E	LRDR	- EYE 100% CONCENTRIC INNER D22/OUTER D28								-	- -	-	14.3N 127.7E	-
152	130101Z	14.5N	125.1E	SAT	(IR DATA)			PCN 1 NOAA-5									
153	130300Z	14.7N	124.7E	LRDR	- EYE 100% CONCENTRIC INNER D14/OUTER D20								-	- -	-	14.3N 127.7E	-
154	130304Z	14.7N	124.6E	P	2 2	700	20 88 290	50 65 290	75	930	248	18 15	CIRC		18		17
155	130400Z	14.7N	124.5E	LRDR	- EYE 100% CONCENTRIC INNER D12/OUTER D28								-	- -	-	14.3N 127.7E	-
156	130500Z	14.7N	124.3E	LRDR	- EYE 80% CIRC OPEN NNE INNER 10/OUTER 30								-	- -	-	14.3N 127.7E	-
157	130600Z	14.7N	124.3E	LRDR	- 10522								-	- -	-	14.1N 123.0E	-
158	130700Z	14.7N	124.1E	LRDR	- 10522								-	- -	-	14.1N 123.0E	-
159	130800Z	14.6N	123.8E	LRDR	- 10522								-	- -	-	14.1N 123.0E	-
160	130800Z	14.7N	124.0E	LRDR	- EYE 100% CIRC D10 MOVG WNW 11 KTS								-	- -	-	16.6N 120.3E	-
161	130834Z	14.5N	123.7E	P	2 2	700	110 94 20	10 120 40	30	924	242	18 15	CIRC		14		17
162	131000Z	14.6N	123.6E	LRDR	- 10522								-	- -	-	14.1N 123.0E	-
163	131134Z	14.6N	123.4E	SAT	(IR DATA)			PCN 1 DMSP									
164	131140Z	14.6N	123.4E	SAT	(IR DATA)			PCN 1 NOAA-5									
165	131200Z	14.7N	123.1E	LRDR	- 10311								-	- -	-	14.1N 123.0E	-
166	131200Z	14.8N	123.4E	LRDR	- 1078/								-	- -	-	16.3N 120.6E	-
167	131300Z	14.6N	122.9E	LRDR	- 10311								-	- -	-	14.1N 123.0E	-
168	131300Z	14.7N	123.3E	LRDR	- 10382								-	- -	-	16.3N 120.6E	-
169	131400Z	14.7N	123.1E	LRDR	- 10373								-	- -	-	16.3N 120.6E	-
170	131430Z	14.5N	122.8E	LRDR	- PSBL 15° SPRL BND OVRLAY								-	- -	-	15.2N 120.6E	-
171	131459Z	14.7N	122.6E	SAT	(IR DATA)			PCN 1 DMSP									
172	131459Z	14.7N	122.7E	SAT	(IR DATA)			PCN 1 DMSP									
173	131500Z	14.7N	122.6E	LRDR	- 10321								-	- -	-	14.1N 123.0E	-
174	131500Z	14.7N	122.8E	LRDR	- 10372								-	- -	-	16.3N 120.6E	-
175	131500Z	14.6N	122.8E	LRDR	- PSBL 15° OVRLAY								-	- -	-	15.2N 120.6E	-
176	131522Z	14.8N	122.6E	P	2 2	700	360 90 270	30 - -	-	935	252	15 11	CIRC		6		18
177	131600Z	14.7N	122.4E	LRDR	- 11321								-	- -	-	14.1N 123.0E	-
178	131600Z	14.7N	122.6E	LRDR	- 10312								-	- -	-	16.3N 120.6E	-
179	131830Z	14.8N	121.9E	LRDR	- PSBL EYE FAIR FIX 60% ELIP AXIS 10/5 MOVMT 1010								-	- -	-	15.2N 120.6E	-
180	131900Z	14.9N	122.0E	LRDR	- 1231/								-	- -	-	16.3N 120.6E	-

181	131930Z	15.0N	121.6E	LRDR	- EYE GOOD FIX 90% WALL CLD CIRC D6 1212	-	--	-	15.2N	120.6E	-
182	132000Z	15.0N	121.7E	LRDR	- 1015/	-	--	-	16.3N	120.6E	-
183	132100Z	15.0N	121.5E	LRDR	- 1011/	-	--	-	16.3N	120.6E	-
184	132130Z	15.0N	121.3E	LRDR	- PSBL EYE 10° SPRL OVRLAY POOR FIX CIRC D6 EYE 70% FILLED	-	--	-	15.2N	120.6E	-
185	132235Z	15.1N	121.1E	SAT	(T4.0/5.0-/W1.0/24HRS) PCN 5 UNSP						
186	132300Z	15.0N	121.0E	LRDR	- PSBL CENT APPROX 120/29 FROM RPMK	-	--	-	16.0N	120.3E	-
187	140011Z	15.1N	120.6E	SAT	(T5.0/5.5 /S /23HRS) NOAA-5 (CONF 01)						
188	140017Z	15.3N	120.7E	SAT	(IR DATA) NOAA-5						
189	140200Z	15.2N	120.0E	LRDR	- 1060/	-	--	-	16.3N	120.6E	-
190	140300Z	15.2N	119.7E	LRDR	- 1083/	-	--	-	16.3N	120.6E	-
191	140430Z	15.5N	119.9E	LRDR	- PSBL EYE 55PCT MOVING NW 10	-	--	-	16.0N	120.3E	-
192	140500Z	15.4N	119.3E	LRDR	- 1048/	-	--	-	16.3N	120.6E	-
193	140600Z	15.5N	119.0E	LRDR	- 1153/	-	--	-	16.3N	120.6E	-
194	140630Z	15.8N	119.6E	LRDR	- PSBL CENT 35%	-	--	-	16.0N	120.3E	-
195	140947Z	15.5N	118.6E	P	5 5 700 120 51 30 20 25 20 120 994 303 14 11	-	--	-			19
196	141253Z	15.8N	118.3E	SAT	(IR DATA) NOAA-5						
197	141257Z	16.5N	118.1E	SAT	(IR DATA) NOAA-5 (CONF 02)						
198	141536Z	16.0N	118.3E	P	2 5 700 140 64 40 120 - - - 1004 313 13 12	-	--	-			20
199	141623Z	15.8N	118.2E	SAT	(IR DATA) PCN 5 UNSP						
200	142042Z	16.2N	118.2E	P	3 10 700 60 41 320 135 - - - 1004 312 13 12	-	--	-			20
201	142218Z	16.3N	118.1E	SAT	(IR DATA) PCN 5 UNSP						
202	150058Z	16.5N	118.4E	SAT	(IR DATA) PCN 6 NOAA-4						
203	150129Z	16.4N	118.4E	SAT	(T2.5/3.5 / / HRS) PCN 5 NOAA-5						
204	150920Z	17.3N	118.1E	P	5 5 700 190 55 60 120 40 280 20 - 309 13 11	ELIP	SE-NW	15X 8			21
205	151100Z	17.4N	118.3E	SAT	(IR DATA) PCN 5 UNSP						
206	151209Z	17.7N	118.4E	SAT	(IR DATA) PCN 5 NOAA-5						
207	151215Z	17.0N	118.2E	SAT	(IR DATA) NOAA-5 (CONF C2)						
208	151605Z	18.3N	120.1E	SAT	(IR DATA) PCN 5 UNSP						
209	151605Z	17.8N	118.8E	SAT	(IR DATA) PCN 6 UNSP						
210	151605Z	17.7N	120.2E	SAT	(IR DATA) PCN 6 UNSP						
211	152154Z	19.5N	119.2E	P	2 15 700 220 25 90 130 - - - 998 30! 12 13	-	--	-			22
212	152201Z	18.9N	120.7E	SAT	(IR DATA) PCN 5 UNSP						
213	160038Z	19.8N	121.5E	SAT	(T2.0/2.0 / / HRS) NOAA-5 (CONF 02)						
214	160045Z	19.5N	120.3E	SAT	(T1.0/2.0 /W1.5/23HRS) PCN 5 NOAA-5						
215	160236Z	20.3N	120.9E	P	2 20 700 240 11 160 25 25 260 150 999 30! 12 10	-	--	-			22
216	160306Z	20.0N	120.8E	SAT	(IR DATA) PCN 5 UNSP						
217	160306Z	19.8N	122.6E	SAT	(T1.0/1.0 / / HRS) PCN 5 UNSP						
218	161043Z	20.6N	121.5E	SAT	(IR DATA) PCN 5 UNSP						
219	161125Z	20.8N	122.2E	SAT	(IR DATA) PCN 5 NOAA-5						
220	161548Z	21.0N	122.9E	SAT	(IR DATA) PCN 5 UNSP						
221	161548Z	21.6N	124.5E	SAT	(IR DATA) PCN 5 UNSP						
222	162146Z	21.3N	124.9E	SAT	(IR DATA) PCN 5 UNSP						
223	170001Z	21.5N	125.7E	SAT	(T1.0/1.0 /S /25HRS) PCN 5 NOAA-5						

TYPHOON LUCY
FIX POSITIONS FOR CYCLONE NO. 20
0600Z 28 NOV TO 1800Z 07 DEC

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	250842Z	6.7N 170.5E	SAT	(IR DATA)			PCN 6 NOAA-5								
2	252118Z	7.1N 168.9E	SAT	(T1.0/1.5 / / HRS)			PCN 6 NOAA-5								
3	260010Z	7.1N 168.5E	SAT	(IR DATA)			PCN 6 DMSP								
4	260954Z	8.3N 167.3E	SAT	(IR DATA)			PCN 6 NOAA-5								
5	262231Z	7.7N 165.9E	SAT	(T1.0/1.0 /S /25HRS)			PCN 5 NOAA-5								
6	270910Z	6.9N 165.0E	SAT	(IR DATA)			PCN 6 NOAA-5								
7	271234Z	6.7N 163.8E	SAT	(IR DATA)			PCN 6 DMSP								
8	272017Z	6.9N 161.9E	SAT	(T2.0/2.0 / / HRS)			PCN 6 DMSP								
9	272147Z	6.8N 162.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
10	280116Z	7.2N 161.3E	SAT	(IR DATA)			PCN 3 DMSP								
11	280600Z	6.7N 159.9E	P	2 20	700	30 45 300 20	40 310 20	997	-	26 26	-	- -	-		1
12	280859Z	6.8N 158.8E	SAT	(IR DATA)			PCN 6 DMSP								
13	280859Z	7.4N 157.7E	SAT	(IR DATA)			PCN 6 DMSP								
14	281023Z	6.8N 158.2E	SAT	(IR DATA)			PCN 2 NOAA-5								
15	281357Z	7.2N 156.6E	SAT	(IR DATA)			PCN 6 DMSP								
16	281358Z	7.1N 157.4E	SAT	(IR DATA)			PCN 6 DMSP								
17	282000Z	7.5N 154.6E	SAT	(T2.0/2.0 /S /24HRS)			PCN 5 DMSP								
18	282000Z	6.4N 156.6E	SAT	(T2.0/2.0 / / HRS)			PCN 6 DMSP								
19	282256Z	7.0N 154.5E	SAT	(T2.0/2.0 / / HRS)			NOAA-5 (CONF 02)								
20	282259Z	6.6N 155.1E	SAT	(IR DATA)			PCN 5 NOAA-5								
21	290058Z	6.5N 156.7E	SAT	(IR DATA)			PCN 4 DMSP								
22	290327Z	7.6N 154.0E	P	4 6	700	110 45 30 60	30 180 10	993	308	10 9	-	- -	-		2
23	290841Z	8.6N 151.8E	SAT	(IR DATA)			PCN 6 DMSP								
24	290842Z	8.3N 151.7E	SAT	(IR DATA)			PCN 6 DMSP								
25	290939Z	8.5N 151.6E	SAT	(IR DATA)			PCN 6 NOAA-5								
26	290942Z	7.0N 154.0E	SAT	(IR DATA)			NOAA-5 (CONF 03)								
27	291340Z	9.0N 151.1E	SAT	(IR DATA)			PCN 6 DMSP								
28	292125Z	8.7N 148.5E	SAT	(T2.0/2.0 /S /25HRS)			PCN 5 DMSP								
29	292212Z	7.5N 150.9E	SAT	(T2.5/2.5 /D0.5/25HRS)			NOAA-5 (CONF 01)								
30	292215Z	8.6N 147.8E	SAT	(IR DATA)			PCN 5 NOAA-5								
31	292324Z	8.6N 147.1E	SAT	(IR DATA)			PCN 5 NOAA-4								
32	300725Z	7.3N 148.7E	P	5 15	1500	360 27 280 90	25 280 90	1004	-	25 25	-	- -	-		4
33	301006Z	8.3N 147.9E	SAT	(IR DATA)			PCN 6 DMSP								
34	301006Z	7.7N 145.9E	SAT	(IR DATA)			PCN 5 DMSP								
35	301051Z	8.5N 147.4E	SAT	(IR DATA)			PCN 6 NOAA-5								
36	301054Z	9.2N 145.6E	SAT	(IR DATA)			NOAA-5 (CONF 01)								
37	301323Z	7.4N 146.6E	SAT	(IR DATA)			PCN 6 DMSP								
38	301323Z	7.0N 145.6E	SAT	(IR DATA)			PCN 6 DMSP								
39	302107Z	8.1N 144.5E	SAT	(T3.0/3.0 /D1.0/24HRS)			PCN 6 DMSP								
40	302140Z	7.6N 145.2E	P	5 20	700	50 45 350 240	25 360 105	1000	-	25 26	-	- -	-		5
41	302324Z	9.8N 143.3E	SAT	(T3.0/3.0 /D0.5/25HRS)			NOAA-5 (CONF 01)								
42	302327Z	8.3N 144.1E	SAT	(IR DATA)			PCN 6 NOAA-5								
43	010205Z	8.1N 141.4E	SAT	(IR DATA)			PCN 5 DMSP								
44	010230Z	8.1N 141.5E	P	5 5	1500	130 45 60 95	40 60 95	1001	-	25 25	-	- -	-		5
45	010949Z	10.6N 139.8E	SAT	(IR DATA)			PCN 5 DMSP								
46	010949Z	8.9N 138.6E	SAT	(IR DATA)			PCN 6 DMSP								
47	011204Z	10.8N 138.8E	SAT	(IR DATA)			PCN 5 NOAA-5								
48	011206Z	10.0N 138.5E	SAT	(IR DATA)			NOAA-5 (CONF 01)								
49	011439Z	10.4N 137.6E	P	2 2	700	160 50 100 100	- - -	992	302	15 13	-	- -	-		6
50	011446Z	10.3N 137.3E	SAT	(IR DATA)			PCN 5 DMSP								
51	012120Z	11.3N 136.4E	P	2 5	700	- - - -	- - -	989	297	16 11	CIRC		40		6
52	012232Z	11.5N 136.1E	SAT	(T3.5/3.5 /D0.5/25HRS)			PCN 5 DMSP								
53	012232Z	11.4N 136.0E	SAT	(IR DATA)			PCN 3 DMSP								
54	012319Z	11.6N 136.1E	SAT	(IR DATA)			PCN 6 NOAA-4								
55	020036Z	11.7N 136.2E	SAT	(T4.0/4.0 /D1.0/25HRS)			NOAA-5 (CONF 01)								
56	020040Z	11.8N 135.6E	SAT	(IR DATA)			PCN 6 NOAA-5								
57	020147Z	11.2N 135.0E	SAT	(IR DATA)			PCN 5 DMSP								
58	020147Z	11.2N 134.8E	SAT	(T4.0/4.0 / / HRS)			PCN 3 DMSP								
59	020243Z	11.4N 134.8E	P	4 6	700	130 75 60 28	80 60 28	984	294	18 14	ELIP	N-S	20X25		7
60	021114Z	11.7N 133.5E	SAT	(IR DATA)			PCN 5 DMSP								
61	021114Z	11.6N 133.3E	SAT	(IR DATA)			PCN 5 DMSP								
62	021120Z	11.3N 133.4E	SAT	(IR DATA)			PCN 5 NOAA-5								
63	021123Z	12.3N 133.4E	SAT	(IR DATA)			NOAA-5 (CONF 02)								
64	021429Z	11.7N 133.0E	SAT	(IR DATA)			PCN 5 DMSP								
65	021429Z	11.6N 133.1E	SAT	(IR DATA)			PCN 5 DMSP								
66	022139Z	12.7N 131.8E	P	5 3	700	170 100 60 10	100 270 7	946	262	18 12	CIRC		12		8
67	022215Z	12.8N 131.9E	SAT	(T5.0/5.0 /D1.5/24HRS)			PCN 1 DMSP								
68	022215Z	12.6N 131.7E	SAT	(T4.5/4.5 /D0.5/20HRS)			PCN 3 DMSP								
69	022351Z	13.0N 131.5E	SAT	(T5.5/5.5 /D1.5/25HRS)			NOAA-5 (CONF 01)								
70	022356Z	12.9N 131.3E	SAT	(IR DATA)			PCN 1 NOAA-5								
71	030254Z	12.9N 130.9E	P	5 2	700	140 105 50 30	110 50 8	931	249	23 12	CIRC		12		8
72	030311Z	13.0N 130.9E	SAT	(IR DATA)			PCN 1 DMSP								
73	030311Z	13.1N 131.0E	SAT	(IR DATA)			PCN 1 DMSP								
74	031057Z	13.3N 130.1E	SAT	(IR DATA)			PCN 1 DMSP								
75	031057Z	13.4N 130.2E	SAT	(IR DATA)			PCN 1 DMSP								
76	031232Z	13.4N 129.8E	SAT	(IR DATA)			PCN 1 NOAA-5								
77	031235Z	13.3N 129.9E	SAT	(IR DATA)			NOAA-5 (CONF 01)								
78	031411Z	13.4N 129.4E	SAT	(IR DATA)			PCN 1 DMSP								
79	031411Z	13.6N 129.8E	SAT	(IR DATA)			PCN 1 DMSP								
80	031443Z	13.7N 129.5E	P	5 2	700	140 120 10 13	- - -	919	238	26 12	CIRC		18		9
81	031553Z	13.5N 129.8E	SAT	(IR DATA)			PCN 1 DMSP								
82	032038Z	14.3N 129.0E	P	5 3	700	40 90 300 25	- - -	920	237	21 12	CIRC		25		9
83	032158Z	14.4N 128.9E	SAT	(T5.5/5.5-/D1.0/24HRS)			PCN 1 DMSP								
84	032306Z	14.5N 128.9E	SAT	(T6.0/6.0 /D0.5/23HRS)			NOAA-5 (CONF 01)								
85	040108Z	14.7N 128.8E	SAT	(T5.0/5.0 / / HRS)			PCN 1 NOAA-5								
86	040239Z	14.8N 128.5E	P	4 5	700	340 90 250 28	90 240 8	931	248	17 11	ELIP	SE-NW	28X24		10
87	040253Z	15.0N 128.5E	SAT	(IR DATA)			PCN 1 DMSP								
88	040253Z	15.0N 128.7E	SAT	(IR DATA)			PCN 1 DMSP								
89	040830Z	15.8N 128.6E	P	4 5	700	10 70 270 13	40 290 120	933	250	16 11	CIRC		20		10
90	041148Z	16.5N 128.4E	SAT	(IR DATA)			PCN 1 NOAA-5								

91	041153Z	15.5N	128.5E	SAT	(IR DATA)								NOAA-5	(CONF 01)								
92	041448Z	17.8N	128.5E	P	2	5	700	260	125	180	45	-	-	-	943	260	16	16	ELIP	N-S	40X30	11
93	041535Z	17.1N	128.9E	SAT	(IR DATA)						PCN	1	UMSP									
94	042140Z	18.3N	129.6E	SAT	(IR DATA)						PCN	3	UMSP									
95	042140Z	18.4N	129.7E	SAT	(T4.5/4.5 / / HRS)						PCN	3	UMSP									
96	042144Z	18.2N	129.4E	P	5	5	700	90	60	350	15	100	250	8	942	258	17	14	CIRC		40	11
97	050017Z	19.3N	129.9E	SAT	(T5.0/5.5 /W1.0/25HRS)								NOAA-5	(CONF 01)								
98	050024Z	18.8N	129.9E	SAT	(T4.5/5.0 /W0.5/23HRS)						PCN	3	NOAA-5									
99	050236Z	19.3N	130.3E	SAT	(IR DATA)						PCN	1	UMSP									
100	050236Z	19.3N	130.3E	SAT	(IR DATA)						PCN	3	UMSP									
101	050245Z	19.4N	130.2E	P	10	5	700	240	135	140	35	130	140	30	945	261	17	14	CIRC		40	12
102	051022Z	21.2N	131.9E	SAT	(IR DATA)						PCN	5	UMSP									
103	051022Z	21.7N	132.1E	SAT	(IR DATA)						PCN	5	UMSP									
104	051104Z	21.4N	132.4E	SAT	(IR DATA)						PCN	5	NOAA-5									
105	051110Z	21.2N	132.3E	SAT	(IR DATA)								NOAA-5	(CONF 02)								
106	051517Z	21.9N	133.0E	SAT	(IR DATA)						PCN	5	UMSP									
107	051518Z	21.9N	133.1E	SAT	(IR DATA)						PCN	5	UMSP									
108	052123Z	22.8N	135.5E	SAT	(T2.5/2.5 / / HRS)						PCN	5	UMSP									
109	052123Z	22.8N	135.5E	SAT	(IR DATA)						PCN	6	UMSP									
110	052340Z	22.0N	135.6E	SAT	(IR DATA)						PCN	5	NOAA-5									
111	060255Z	22.1N	136.8E	P	4	10	700	340	50	270	90	130	270	50	988	298	15	16	-	- -	-	13
112	061005Z	22.2N	139.5E	SAT	(IR DATA)						PCN	5	UMSP									
113	061005Z	21.8N	139.3E	SAT	(IR DATA)						PCN	5	UMSP									
114	061020Z	22.4N	139.7E	SAT	(IR DATA)						PCN	5	NOAA-5									
115	061027Z	23.0N	139.0E	SAT	(IR DATA)								NOAA-5	(CONF 01)								
116	061500Z	22.6N	141.5E	SAT	(IR DATA)						PCN	6	UMSP									
117	061500Z	22.6N	141.5E	SAT	(IR DATA)						PCN	5	UMSP									
118	062106Z	22.7N	143.7E	SAT	(T1.0/2.0 /W1.5/24HRS)						PCN	5	UMSP									
119	062106Z	22.7N	143.8E	SAT	(T2.0/2.0 / / HRS)						PCN	5	UMSP									
120	062248Z	22.5N	144.0E	SAT	(T1.0/1.0 / / HRS)								NOAA-5	(CONF 01)								
121	062256Z	23.1N	144.4E	SAT	(IR DATA)						PCN	5	NOAA-5									
122	070450Z	22.4N	146.4E	P	5	2	1500	10	70	270	10	50	280	25	997	-	24	19	-	- -	-	14
123	070948Z	22.0N	149.1E	SAT	(IR DATA)						PCN	6	UMSP									
124	071442Z	21.9N	150.2E	SAT	(IR DATA)						PCN	5	UMSP									
125	072049Z	21.0N	154.9E	SAT	(T 0/1.0 /W1.0/24HRS)						PCN	5	UMSP									
126	072212Z	20.9N	155.4E	SAT	(IR DATA)						PCN	5	NOAA-5									

TYPHOON MARY

FIX POSITIONS FOR CYCLONE NO. 21

0600Z 20 DEC TO 1800Z 03 JAN

FIX NO.	TIME	POSIT	FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR	VEL	BRG	RNG	MAX OBS SFC WIND VEL	BRG	RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	190834Z	8.9N 177.0E	SAT	(IR DATA)					PCN 6		NOAA-5									
2	19111[illegible]Z	8.6N 177.8E	SAT	(IR DATA)					PCN 6		DMSP									
3	191315Z	9.0N 177.5E	SAT	(IR DATA)							SMS-2									
4	191545Z	9.5N 179.8E	SAT	(IR DATA)							SMS-2		(CONF 01)							
5	191929Z	9.0N 176.6E	SAT	(IR DATA)							SMS-2									
6	192046Z	9.6N 177.8E	SAT	(T1.0/1.0 / / HRS)					PCN 6		DMSP									
7	192106Z	9.2N 178.5E	SAT	(T2.5/2.5 / / HRS)							NOAA-5		(CONF 01)							
8	19211[illegible]Z	9.1N 178.3E	SAT	(T1.0/1.0 / / HRS)					PCN 5		NOAA-5									
9	192352Z	11.4N 180.4E	SAT	(IR DATA)					PCN 6		DMSP									
10	192352Z	9.8N 178.9E	SAT	(IR DATA)					PCN 6		DMSP									
11	200415Z	9.6N 179.0E	SAT	(IR DATA)							SMS-2									
12	200747Z	9.7N 178.9E	SAT	(IR DATA)					PCN 6		DMSP									
13	200753Z	10.0N 179.0E	SAT	(IR DATA)							NOAA-5		(CONF 01)							
14	201052Z	10.2N 179.6E	SAT	(IR DATA)					PCN 6		DMSP									
15	201053Z	10.1N 179.1E	SAT	(IR DATA)					PCN 6		DMSP									
16	201115Z	9.5N 179.1E	SAT	(IR DATA)							SMS-2		(60 NM)							
17	201848Z	10.0N 179.3E	SAT	(IR DATA)					PCN 6		DMSP									
18	201949Z	9.5N 178.9E	SAT	(IR DATA)							SMS-2		(60 NM)							
19	202022Z	9.0N 180.0E	SAT	(T3.0/3.0 /D0.5/23HRS)							NOAA-5		(CONF 01)							
20	210215Z	9.5N 179.0E	SAT	(IR DATA)							SMS-2									
21	210315Z	9.7N 178.7E	SAT	(IR DATA)							SMS-2		(60 NM)							
22	210729Z	10.3N 179.7E	SAT	(T2.0/3.0 / / HRS)					PCN 6		DMSP									
23	210730Z	10.1N 179.2E	SAT	(IR DATA)					PCN 6		DMSP									
24	210902Z	10.0N 178.8E	SAT	(IR DATA)							NOAA-5									
25	210902Z	10.2N 179.2E	SAT	(IR DATA)					PCN 6		NOAA-5									
26	211215Z	10.0N 178.2E	SAT	(IR DATA)							SMS-2		(60 NM)							
27	211216Z	9.8N 179.0E	SAT	(T2.0/ 3.0 /W1.0/12 HRS					PCN 4		DMSP									
28	211217Z	10.5N 179.0E	SAT	(IR DATA)					PCN 6		DMSP									
29	211515Z	9.8N 178.0E	SAT	(IR DATA)							SMS-2									
30	211831Z	10.4N 176.7E	SAT	(T3.0/3.0 / / HRS)					PCN 6		DMSP									
31	212133Z	10.0N 177.6E	SAT	(T3.5/3.5 /D0.5/25HRS)							NOAA-5		(CONF 02)							
32	212138Z	9.6N 177.1E	SAT	(T3.0/3.0 / / HRS)					PCN 5		NOAA-5									
33	212317Z	10.2N 177.1E	SAT	(T3.0/3.0 / / HRS)					PCN 4		DMSP									
34	212317Z	10.9N 176.2E	SAT	(T3.0/3.0 / / HRS)					PCN 6		DMSP									
35	220713Z	10.2N 175.1E	SAT	(IR DATA)					PCN 6		DMSP									
36	220745Z	9.9N 174.9E	SAT	(IR DATA)							SMS-2									
37	220818Z	10.2N 174.9E	SAT	(IR DATA)					PCN 6		NOAA-5									
38	221115Z	10.5N 174.2E	SAT	(IR DATA)							SMS-2		(60 NM)							
39	221159Z	10.6N 173.5E	SAT	(T3.0/3.0/ / HRS)					PCN 6		DMSP									
40	221845Z	11.0N 174.0E	SAT	(IR DATA)							SMS-2		(CONF 2)							
41	221955Z	11.1N 173.4E	SAT	(T4.5/4.5 / / HRS)					PCN 1		DMSP									
42	221955Z	11.1N 173.5E	SAT	(T4.5/4.5 /D1.5/21HRS)					PCN 2		DMSP									
43	222015Z	11.1N 173.3E	SAT	(T4.0/4.0 / / HRS)							SMS-2		(60 NM)							
44	222051Z	11.6N 173.3E	SAT	(T5.0/5.0 /D1.5/23HRS)							NOAA-5		(CONF 01)							
45	222054Z	11.1N 173.3E	SAT	(IR DATA)					PCN 2		NOAA-5									
46	222054Z	11.4N 173.3E	SAT	(T4.0/4.0 /D1.0/22HRS)					PCN 2		NOAA-5									
47	222259Z	11.2N 172.1E	SAT	(T5.0/5.0 /D2.0/24HRS)					PCN 4		DMSP									
48	230219Z	11.5N 172.0E	SAT	(IR DATA)							SMS-2		(30 NM)							
49	230837Z	11.6N 171.7E	SAT	(IR DATA)					PCN 6		DMSP									
50	230837Z	12.4N 171.6E	SAT	(IR DATA)					PCN 6		DMSP									
51	230931Z	12.1N 171.4E	SAT	(IR DATA)					PCN 6		NOAA-5									
52	230934Z	11.6N 171.3E	SAT	(IR DATA)							NOAA-5		(CONF 01)							
53	231141Z	12.6N 173.2E	SAT	(IR DATA)					PCN 6		DMSP									
54	231938Z	12.3N 170.3E	SAT	(T4.0/4.5 /W0.5/24HRS)					PCN 6		DMSP									
55	231945Z	12.8N 169.8E	SAT	(T3.0/4.0-/W1.0/24HRS)							SMS-2		(40 NM)							
56	232207Z	12.6N 170.5E	SAT	(T4.0/4.5 / / HRS)					PCN 5		NOAA-5									
57	240023Z	12.9N 170.2E	SAT	(IR DATA)					PCN 5		DMSP									
58	240023Z	12.8N 170.2E	SAT	(IR DATA)					PCN 6		DMSP									
59	240115Z	12.5N 169.8E	P	4 2	700	330	75	240	30	90	240	32	972	289	18 13	CIRC		30		1
60	240815Z	13.0N 169.1E	SAT	(IR DATA)							NOAA-5		(CONF 01)							
61	240820Z	12.9N 169.3E	SAT	(IR DATA)					PCN 4		DMSP									
62	240820Z	12.9N 169.5E	SAT	(IR DATA)					PCN 4		DMSP									
63	240847Z	12.9N 169.1E	SAT	(IR DATA)					PCN 4		NOAA-5									
64	240847Z	12.7N 169.2E	SAT	(IR DATA)					PCN 2		NOAA-5									
65	241305Z	12.9N 169.4E	SAT	(IR DATA)					PCN 1		DMSP									
66	241305Z	12.7N 169.4E	SAT	(IR DATA)					PCN 4		DMSP									
67	241315Z	13.0N 168.8E	SAT	(IR DATA)							SMS-2		(60 NM)							
68	242049Z	12.6N 169.1E	SAT	(IR DATA)							SMS-2		(30 NM)							
69	242120Z	12.4N 169.4E	SAT	(T5.0/5.0 / / HRS)							NOAA-5		(CONF 01)							
70	242123Z	12.4N 169.3E	SAT	(T5.0/5.0 /D1.0/23HRS)					PCN 1		NOAA-5									
71	250006Z	12.2N 169.1E	SAT	(IR DATA)					PCN 2		DMSP									
72	250249Z	12.3N 169.1E	SAT	(IR DATA)							SMS-2		(60 NM)							
73	250314Z	11.9N 169.4E	P	5 5	700	300	115	210	25	100	210	25	947	263	17 10	CIRC		15		2
74	250803Z	11.8N 169.0E	SAT	(IR DATA)					PCN 2		DMSP									
75	250803Z	11.9N 168.9E	SAT	(IR DATA)					PCN 4		DMSP									
76	250803Z	11.6N 168.7E	SAT	(IR DATA)					PCN 6		NOAA-5									
77	250959Z	11.8N 168.7E	SAT	(IR DATA)					PCN 4		NOAA-5									
78	251002Z	12.0N 169.0E	SAT	(IR DATA)							NOAA-5		(CONF 01)							
79	251248Z	11.8N 168.7E	SAT	(IR DATA)					PCN 6		DMSP									
80	251415Z	11.3N 168.5E	SAT	(IR DATA)							SMS-2		(60 NM)							
81	251559Z	11.1N 168.4E	P	2 4	700	340	82	260	45	-	-	-	964	271	13 11	ELIP	E-W	35X25		3
82	251625Z	11.1N 168.9E	LRDR	-	15° SPRL OVRLY PSBL EYE POOR FIX											-	- -	-	8.7N 167.7E	-
83	251725Z	11.2N 168.6E	LRDR	-	15° SPRL OVRLY PSBL EYE POOR FIX											-	- -	-	8.7N 167.7E	-
84	251825Z	10.8N 168.6E	LRDR	-	15° SPRL OVRLY PSBL EYE POOR FIX											-	- -	-	8.7N 167.7E	-
85	252025Z	10.9N 168.0E	LRDR	-	15° SPRL OVRLY PSBL EYE POOR FIX											-	- -	-	8.7N 167.7E	-
86	252039Z	10.4N 168.0E	SAT	(T5.0/5.0 / / HRS)					PCN 5		NOAA-5									
87	252045Z	10.4N 165.6E	SAT	(IR DATA)					PCN 5		DMSP									
88	252045Z	10.7N 167.5E	SAT	(T4.0/4.5 / / HRS)					PCN 6		DMSP									
89	252050Z	10.5N 167.3E	SAT	(T3.5/4.5 / / HRS)							SMS-2		(40 NM)							
90	252231Z	10.5N 168.0E	SAT	(T4.0/5.0 /W1.0/25HRS)							NOAA-5		(CONF 01)							

91	252235Z	10.2N	167.8E	SAT	(T5.0/5.0 /S /25HRS)						PCN 6 NOAA-5												
92	252325Z	10.3N	167.4E	LRDR	- 15° SPRL OVRLY PSBL EYE POOR FIX														-	--	-	8.7N 167.7E	-
93	252348Z	10.4N	167.1E	SAT	(T4.0/5.0 / / HRS)						PCN 6 UMSP												
94	260025Z	10.2N	167.2E	LRDR	- 15° SPRL OVRLY PSBL EYE POOR FIX														-	--	-	8.7N 167.7E	-
95	260130Z	10.2N	167.0E	LRDR	- 15° SPRL OVRLY PSBL EYE POOR FIX														-	--	-	8.7N 167.7E	-
96	260215Z	10.6N	165.8E	SAT	(IR DATA)						SMS-2			(60 NM)									
97	260225Z	10.1N	166.8E	LRDR	- 15° SPRL OVRLY PSBL EYE POOR FIX														-	--	-	8.7N 167.7E	-
98	260357Z	10.1N	166.6E	P	5	15	700	20	82	270	15	85	360	20	977	289	28	21	-	--	-		
99	260425Z	10.0N	166.1E	LRDR	- 15° SPRL OVRLY PSBL EYE POOR FIX														-	--	-	8.7N 167.7E	-
100	260525Z	10.0N	166.1E	LRDR	- 15° SPRL OVRLY PSBL EYE POOR FIX														-	--	-	8.7N 167.7E	-
101	260915Z	9.6N	165.1E	SAT	(IR DATA)						PCN 6 NOAA-5												
102	260915Z	9.5N	165.1E	SAT	(IR DATA)						NOAA-5												
103	261230Z	9.4N	164.5E	SAT	(IR DATA)						PCN 5 UMSP												
104	261415Z	8.9N	164.0E	SAT	(IR DATA)						SMS-2			(60 NM)									
105	261437Z	9.3N	164.1E	P	5	15	700	10	55	270	25	-	-	-	987	298	16	15	-	--	-		5
106	262028Z	8.5N	162.6E	SAT	(T3.5/4.5 / / HRS)						PCN 6 UMSP												
107	262028Z	8.3N	162.4E	SAT	(T4.0/5.0 / / HRS)						PCN 6 UMSP												
108	262147Z	9.8N	162.8E	SAT	(T3.5/4.5 /W0.5/23HRS)						NOAA-5			(CONF 02)									
109	262151Z	8.6N	162.2E	SAT	(IR DATA)						PCN 5 NOAA-5												
110	270112Z	8.7N	161.3E	SAT	(IR DATA)						PCN 6 UMSP												
111	270331Z	9.0N	160.2E	P	5	3	700	150	56	50	50	60	50	60	991	301	15	14	-	--	-		6
112	270910Z	9.0N	158.3E	SAT	(IR DATA)						PCN 6 UMSP												
113	270910Z	9.3N	158.4E	SAT	(IR DATA)						PCN 6 UMSP												
114	271027Z	9.7N	157.9E	SAT	(IR DATA)						PCN 5 NOAA-5												
115	271030Z	9.2N	158.2E	SAT	(IR DATA)						NOAA-5			(CONF 01)									
116	271354Z	9.0N	156.6E	SAT	(IR DATA)						PCN 6 UMSP												
117	271354Z	9.0N	156.1E	SAT	(IR DATA)						PCN 6 UMSP												
118	271440Z	8.7N	156.5E	P	5	5	700	70	57	330	120	-	-	-	999	308	12	11	CIRC		15		7
119	272011Z	9.1N	154.3E	SAT	(T3.0/3.5 /W0.5/24HRS)						PCN 5 UMSP												
120	272011Z	9.0N	154.0E	SAT	(T3.0/3.5 /W1.0/24HRS)						PCN 6 UMSP												
121	272259Z	9.3N	153.7E	SAT	(T3.5/3.5 /S /25HRS)						NOAA-5			(CONF 02)									
122	272304Z	9.0N	153.6E	SAT	(IR DATA)						PCN 5 NOAA-5												
123	280054Z	9.1N	153.5E	SAT	(IR DATA)						PCN 5 UMSP												
124	280232Z	9.7N	152.9E	P	15	8	700	150	30	130	20	-	-	-	999	308	15	12	-	--	-		8
125	280853Z	9.5N	150.7E	SAT	(IR DATA)						PCN 6 UMSP												
126	280853Z	9.6N	150.7E	SAT	(IR DATA)						PCN 6 UMSP												
127	280943Z	9.7N	150.6E	SAT	(IR DATA)						PCN 5 NOAA-5												
128	281142Z	10.1N	150.0E	SAT	(IR DATA)						NOAA-5			(CONF 01)									
129	281336Z	10.2N	150.1E	SAT	(IR DATA)						PCN 6 UMSP												
130	281521Z	11.4N	149.5E	P	10	3	700	140	50	20	20	-	-	-	990	300	10	11	ELIP	SW-NE	25X15		9
131	282135Z	11.0N	148.4E	SAT	(T3.0/3.0 /S /24HRS)						PCN 6 UMSP												
132	282136Z	11.5N	148.6E	SAT	(T3.5/3.5 /D0.5/25HRS)						PCN 6 UMSP												
133	282136Z	10.9N	148.3E	SAT	(T3.5/3.5 / / HRS)						PCN 3 UMSP												
134	282204Z	11.3N	148.7E	P	20	5	700	70	61	320	15	70	120	15	991	301	13	9	-	--	-		10
135	282220Z	11.5N	148.5E	SAT	(IR DATA)						PCN 5 NOAA-5												
136	290037Z	11.4N	147.8E	SAT	(IR DATA)						PCN 6 UMSP												
137	290218Z	11.0N	147.6E	SAT	(IR DATA)						PCN 3 UMSP												
138	290239Z	11.1N	147.6E	P	10	2	700	80	65	340	26	50	340	80	984	294	14	12	CIRC		18		10
139	290810Z	11.5N	146.5E	LRDR	- PSBL EYE FAIR FIX CIRC D20 60% WALL CLD														-	--	-	13.6N 144.9E	-
140	290835Z	11.5N	146.5E	LRDR	- PSBL EYE FAIR FIX ELIP AXIS 30/20 70% WALL CLD														-	--	-	13.6N 144.9E	-
141	290910Z	11.4N	146.2E	LRDR	- EYE GOOD FIX ELIP AXIS 30/20 70% WALL CLD														-	--	-	13.6N 144.9E	-
142	290935Z	11.4N	146.2E	LRDR	- EYE GOOD FIX ELIP AXIS 25/15 70% WALL CLD														-	--	-	13.6N 144.9E	-
143	290939Z	11.2N	145.9E	P	5	3	700	30	77	330	80	70	320	60	984	295	15	13	CIRC		30		11
144	291010Z	11.4N	145.9E	LRDR	- EYE GOOD FIX ELIP AXIS 25/15 60% WALL CLD														-	--	-	13.6N 144.9E	-
145	291018Z	11.3N	145.9E	SAT	(IR DATA)						PCN 2 UMSP												
146	291018Z	11.2N	145.7E	SAT	(IR DATA)						PCN 3 UMSP												
147	291035Z	11.3N	145.7E	LRDR	- EYE GOOD FIX ELIP AXIS 25/15 60% WALL CLD														-	--	-	13.6N 144.9E	-
148	291100Z	11.2N	145.6E	SAT	(IR DATA)						PCN 4 NOAA-5												
149	291110Z	11.2N	145.5E	LRDR	- EYE GOOD FIX CIRC D25 70% WALL CLD														-	--	-	13.6N 144.9E	-
150	291135Z	11.2N	145.6E	LRDR	- EYE GOOD FIX CIRC D20 60% WALL CLD														-	--	-	13.6N 144.9E	-
151	291210Z	11.2N	145.5E	LRDR	- EYE GOOD FIX ELIP AXIS 25/15 60% WALL CLD														-	--	-	13.6N 144.9E	-
152	291235Z	11.2N	145.3E	LRDR	- EYE POOR FIX CIRC D25 40% WALL CLD														-	--	-	13.6N 144.9E	-
153	291255Z	11.1N	145.1E	P	5	5	700	290	70	200	45	-	-	-	982	293	15	9	CIRC		19		11
154	291310Z	11.2N	145.3E	LRDR	- PSBL CENT POOR FIX 30% WALL CLD														-	--	-	13.6N 144.9E	-
155	291319Z	11.2N	144.9E	SAT	(IR DATA)						PCN 2 UMSP												
156	291335Z	11.2N	145.1E	LRDR	- PSBL CENT POOR FIX 40% WALL CLD														-	--	-	13.6N 144.9E	-
157	291410Z	11.2N	145.1E	LRDR	- PSBL CENT POOR FIX 40% WALL CLD														-	--	-	13.6N 144.9E	-
158	291433Z	11.0N	145.0E	P	7	2	700	330	65	240	10	-	-	-	979	290	17	-	-	--	-		1
159	292118Z	10.4N	143.3E	SAT	(T2.0/3.0 /W1.5/24HRS)						PCN 4 UMSP												
160	292332Z	10.3N	143.2E	SAT	(IR DATA)						PCN 3 NOAA-5												
161	300201Z	10.4N	142.4E	SAT	(IR DATA)						PCN 3 UMSP												
162	300245Z	10.4N	142.3E	P	4	2	700	300	74	240	20	80	300	21	982	293	15	10	CIRC		40		12
163	301001Z	10.3N	140.8E	SAT	(IR DATA)						PCN 6 UMSP												
164	301001Z	10.2N	140.7E	SAT	(IR DATA)						PCN 4 UMSP												
165	301012Z	10.2N	140.7E	SAT	(IR DATA)						PCN 6 NOAA-5												
166	301014Z	10.2N	140.3E	SAT	(IR DATA)						NOAA-5			(CONF 02)									
167	301433Z	10.2N	139.8E	P	30	7	700	150	55	60	30	-	-	-	992	305	21	17	CIRC		15		13
168	301443Z	10.2N	139.6E	SAT	(IR DATA)						PCN 6 UMSP												
169	302101Z	10.3N	138.6E	SAT	(IR DATA)						PCN 6 UMSP												
170	302243Z	10.1N	137.9E	SAT	(T3.0/3.0 / / HRS)						PCN 5 UMSP												
171	302248Z	10.2N	138.3E	SAT	(T2.0/2.0 / / HRS)						PCN 5 NOAA-5												
172	310039Z	10.8N	137.8E	SAT	(T3.0/3.5 / / HRS)						NOAA-5			(CONF 01)									
173	310143Z	10.3N	137.0E	SAT	(IR DATA)						PCN 6 UMSP												
174	310231Z	9.9N	136.8E	P		4	700	150	40	60	110	-	-	-	998	307	13	11	-	--	-		14
175	310943Z	9.1N	135.4E	SAT	(IR DATA)						PCN 6 UMSP												
176	310943Z	9.3N	135.3E	SAT	(IR DATA)						PCN 6 UMSP												
177	311124Z	9.2N	135.1E	SAT	(IR DATA)						PCN 6 NOAA-5												
178	311425Z	8.9N	133.9E	SAT	(IR DATA)						PCN 6 UMSP												
179	311558Z	8.1N	134.1E	P	5	15	700	90	24	10	30	-	-	-	1003	311	12	11	-	--	-		15
180	312226Z	8.1N	131.8E	SAT	(T2.0/2.0 / / HRS)						PCN 5 UMSP												

181	312226Z	9.7N	132.3E	SAT	(T3.0/3.0 /S /24HRS)	PCN 5 DMSP	
182	312359Z	8.1N	131.2E	SAT	(IR DATA)	PCN 5 NOAA-5	
183	010400Z	10.0N	131.0E	P	10 2 1500 270 40 180	50 45 180	35 994 - 27 25 - - - - 16
184	011108Z	10.3N	129.0E	SAT	(IR DATA)	PCN 6 DMSP	
185	011108Z	10.4N	128.5E	SAT	(IR DATA)	PCN 6 DMSP	
186	011237Z	9.6N	128.5E	SAT	(IR DATA)	PCN 6 NOAA-5	
187	011239Z	10.0N	128.6E	SAT	(IR DATA)	NOAA-5	(CONF 02)
188	011455Z	9.0N	128.3E	P	5 30 700 170 40 20	40 - -	- 1003 311 14 13 - - - - 17
189	011549Z	10.3N	127.9E	SAT	(IR DATA)	PCN 6 DMSP	
190	012209Z	9.9N	126.4E	SAT	(T3.0/3.0 /D1.0/24HRS)	PCN 5 DMSP	
191	012209Z	9.9N	126.3E	SAT	(T3.5/3.5 /D0.5/24HRS)	PCN 3 DMSP	
192	020108Z	9.5N	126.5E	SAT	(T2.0/2.0 / / HRS)	NOAA-5	(CONF 01)
193	020113Z	9.6N	125.9E	SAT	(IR DATA)	PCN 5 NOAA-5	
194	020610Z	10.4N	125.7E	LRDR	- EYE D10-15 KMS		- - - - 11.0N 125.7E -
195	020800Z	10.6N	125.0E	LRDR	- EYE D10-15 KMS		- - - - 11.0N 125.7E -
196	021000Z	10.4N	124.5E	LRDR	- EYE D10-15 KMS		- - - - 11.0N 125.7E -
197	021051Z	10.5N	124.7E	SAT	(IR DATA)	PCN 5 DMSP	
198	021051Z	10.7N	124.6E	SAT	(IR DATA)	PCN 6 DMSP	
199	021153Z	10.7N	124.5E	SAT	(IR DATA)	PCN 6 NOAA-5	
200	021155Z	10.5N	124.1E	SAT	(IR DATA)	NON DMSP	
201	021531Z	10.7N	123.5E	SAT	(IR DATA)	PCN 5 DMSP	
202	021531Z	10.7N	123.4E	SAT	(IR DATA)	PCN 6 DMSP	
203	022333Z	10.4N	122.0E	SAT	(T2.0/3.0 /W1.5/25HRS)	PCN 5 DMSP	
204	030029Z	9.9N	121.7E	SAT	(T2.0/2.5 / / HRS)	PCN 6 NOAA-5	
205	030232Z	9.9N	121.3E	SAT	(IR DATA)	PCN 5 DMSP	
206	030232Z	10.0N	121.6E	SAT	(T2.0/2.0+/ / HRS)	PCN 5 DMSP	
207	031034Z	10.3N	124.6E	SAT	(IR DATA)	PCN 3 DMSP	
208	031305Z	10.2N	124.2E	SAT	(IR DATA)	PCN 6 NOAA-5	
209	031514Z	10.0N	124.2E	SAT	(IR DATA)	PCN 5 DMSP	

4. NORTH INDIAN OCEAN FIX DATA

FIX POSITIONS FOR TROPICAL CYCLONE NO. 17-77
2000Z 11 MAY TO 0800Z 13 MAY

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	080515Z	7.1N	82.2E	SAT	(T .5/0.5 / / HRS)			PCN 6 DMSP								
2	080657Z	7.5N	71.6E	SAT	(IR DATA)			PCN 6 DMSP								
3	090302Z	9.0N	77.5E	SAT	(IR DATA)			NOAA-5								
4	100410Z	14.0N	87.0E	SAT	(T1.5/1.5 / / HRS)			NOAA-5	(CONF 01)							
5	100440Z	11.9N	88.3E	SAT	(IR DATA)			PCN 6 DMSP								
6	101459Z	14.5N	87.3E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
7	110026Z	14.8N	88.5E	SAT	(T3.0/3.0 / / HRS)			PCN 5 DMSP								
8	110324Z	15.8N	88.1E	SAT	(T2.5/2.5 /D1.0/23HRS)			NOAA-5	(CONF 01)							
9	111303Z	17.0N	89.3E	SAT	(IR DATA)			PCN 5 DMSP								
10	111415Z	16.7N	89.7E	SAT	(IR DATA)			NOAA-5	(CONF 03)							
11	111704Z	15.4N	88.5E	SAT	(IR DATA)			PCN 4 DMSP								
12	111705Z	16.4N	89.5E	SAT	(IR DATA)			PCN 5 DMSP								
13	120018Z	18.5N	89.0E	SAT	(T4.0/4.0 /D1.0/24HRS)			PCN 4 DMSP								
14	120200Z	18.4N	88.2E	SAT	(T4.0/4.0 / / HRS)			PCN 6 DMSP								
15	120240Z	18.8N	89.0E	SAT	(T3.5/3.5 /D1.0/23HRS)			NOAA-5	(CONF 01)							
16	120547Z	20.3N	89.3E	SAT	(T4.0/4.0 / / HRS)			NOAA-5								
17	121303Z	20.8N	89.2E	SAT	(IR DATA)			PCN 3 DMSP								
18	121333Z	21.4N	89.4E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
19	121828Z	22.2N	90.9E	SAT	(T4.0/4.0 /S /24HRS)			PCN 2 DMSP								
20	130006Z	23.8N	90.9E	SAT	(T3.5/4.0-/W0.5/24HRS)			PCN 3 DMSP								
21	130148Z	23.6N	91.7E	SAT	(T4.0/4.0 /S /24HRS)			PCN 4 DMSP								

FIX POSITIONS FOR TROPICAL CYCLONE NO. 18-77
2000Z 10 JUN TO 0800Z 13 JUN

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	090329Z	16.0N	69.0E	SAT	(T1.0/1.0 / / HRS)			NOAA-5	(CONF 01)							
2	091617Z	16.9N	69.4E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
3	100440Z	17.9N	68.3E	SAT	(T2.5/2.5 /D1.5/25HRS)			NOAA-5	(CONF 01)							
4	100448Z	18.7N	68.6E	SAT	(T3.5/1.5 / / HRS)			PCN 4 DMSP								
5	101540Z	18.3N	66.8E	SAT	(IR DATA)			PCN 6 DMSP								
6	102008Z	19.2N	66.1E	SAT	(T3.5/3.5 / / HRS)			PCN 6 DMSP								
7	110242Z	19.5N	66.6E	SAT	(T4.5/3.5 /D1.0/24HRS)			PCN 3 DMSP								
8	110357Z	19.7N	66.0E	SAT	(T3.5/3.5 /D1.0/23HRS)			NOAA-5	(CONF 01)							
9	110404Z	20.2N	65.6E	SAT	(IR DATA)			PCN 4 DMSP								
10	110709Z	19.6N	64.8E	SAT	(IR DATA)			PCN 3 DMSP								
11	111528Z	19.7N	65.0E	SAT	(IR DATA)			PCN 6 DMSP								
12	111950Z	19.6N	61.8E	SAT	(IR DATA)			PCN 5 DMSP								
13	120234Z	20.1N	62.6E	SAT	(T3.5/3.5 /S /24HRS)			PCN 3 DMSP								
14	120251Z	20.1N	61.4E	SAT	(T4.0/4.0 /D0.5/24HRS)			PCN 1 DMSP								
15	120509Z	20.2N	62.3E	SAT	(T5.0/5.0 /D1.5/25HRS)			NOAA-5	(CONF 01)							
16	121515Z	21.1N	60.5E	SAT	(IR DATA)			PCN 6 DMSP								
17	121602Z	20.3N	59.8E	SAT	(IR DATA)			NOAA-5	(CONF 02)							
18	121933Z	20.6N	59.9E	SAT	(IR DATA)			PCN 2 DMSP								
19	130219Z	20.8N	59.1E	SAT	(IR DATA)			PCN 6 DMSP								
20	130425Z	20.5N	58.5E	SAT	(T3.0/4.0 /W2.0/23HRS)			NOAA-5	(CONF 01)							
21	140534Z	20.1N	54.9E	SAT	(T1.0/1.0 /W2.0/25HRS)			NOAA-5	(CONF 01)							

FIX POSITIONS FOR TROPICAL CYCLONE NO. 19-77
2000Z 29 OCT TO 2000Z 31 OCT

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET / FIX LVL / MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	270020Z	12.0N	91.0E	SAT	(IR DATA)	PCN 6 UMSP								
2	270027Z	12.4N	92.4E	SAT	(T2.0/2.0 / / HRS)	PCN 5 UMSP								
3	270535Z	11.4N	92.1E	SAT	(T2.0/2.0 / / HRS)	PCN 6 UMSP								
4	271302Z	11.4N	92.3E	SAT	(IR DATA)	PCN 6 UMSP								
5	271429Z	10.8N	90.4E	SAT	(IR DATA)	NOAA-5	(CONF 02)							
6	271817Z	11.8N	92.6E	SAT	(IR DATA)	PCN 6 UMSP								
7	280144Z	11.5N	88.2E	SAT	(IR DATA)	PCN 6 UMSP								
8	280259Z	11.0N	90.0E	SAT	(T2.0/2.0 / / HRS)	NOAA-5	(CONF 02)							
9	280517Z	13.0N	89.1E	SAT	(T2.0/2.0 /S /24HRS)	PCN 5 UMSP								
10	281245Z	12.1N	89.2E	SAT	(IR DATA)	PCN 5 UMSP								
11	281245Z	12.2N	88.1E	SAT	(IR DATA)	PCN 5 UMSP								
12	281345Z	13.0N	89.8E	SAT	(IR DATA)	NOAA-5	(CONF 02)							
13	281800Z	11.3N	88.0E	SAT	(IR DATA)	PCN 5 UMSP								
14	290127Z	11.3N	88.1E	SAT	(IR DATA)	PCN 6 UMSP								
15	290409Z	11.8N	87.8E	SAT	(T2.0/2.0 /S /25HRS)	NOAA-5	(CONF 01)							
16	290500Z	13.5N	87.9E	SAT	(T2.0/2.0 /S /24HRS)	PCN 4 UMSP								
17	291409Z	12.1N	85.9E	SAT	(IR DATA)	PCN 6 UMSP								
18	291500Z	12.2N	85.1E	SAT	(IR DATA)	NOAA-5	(CONF 01)							
19	291742Z	13.2N	85.4E	SAT	(IR DATA)	PCN 3 UMSP								
20	300110Z	14.2N	85.0E	SAT	(IR DATA)	PCN 3 UMSP								
21	300326Z	14.3N	84.1E	SAT	(T2.0/2.0 /S /23HRS)	NOAA-5								
22	300624Z	13.6N	84.6E	SAT	(IR DATA)	PCN 5 UMSP								
23	301352Z	14.6N	83.2E	SAT	(IR DATA)	PCN 4 UMSP								
24	301415Z	14.0N	83.0E	SAT	(IR DATA)	NOAA-5								
25	301724Z	14.7N	82.4E	SAT	(IR DATA)	PCN 6 UMSP								
26	301906Z	14.9N	82.2E	SAT	(IR DATA)	PCN 6 UMSP								
27	310053Z	15.0N	82.1E	SAT	(IR DATA)	PCN 6 UMSP								
28	310242Z	14.5N	81.5E	SAT	(T3.0/3.0-/D1.0/23HRS)	NOAA-5								
29	310606Z	15.0N	80.6E	SAT	(T3.0/3.0 / / HRS)	PCN 5 UMSP								
30	311335Z	15.8N	79.2E	SAT	(IR DATA)	PCN 6 UMSP								
31	030143Z	16.5N	65.0E	SAT	(IR DATA)	PCN 6 UMSP								
32	030655Z	16.3N	63.0E	SAT	(T1.5/1.5 / / HRS)	PCN 6 UMSP								
33	031425Z	16.6N	61.2E	SAT	(IR DATA)	PCN 6 UMSP								
34	040308Z	16.7N	58.2E	SAT	(IR DATA)	PCN 6 UMSP								
35	040637Z	15.7N	58.4E	SAT	(IR DATA)	PCN 6 UMSP								

FIX POSITIONS FOR TROPICAL CYCLONE NO. 21-77
2000Z 10 NOV TO 2000Z 21 NOV

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET	FIX LVL	MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG	OBS MIN SLP	MIN 700MB HGT	FLT LVL TI/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	091242Z	11.5N	90.0E	SAT	(IR DATA		)	PCN 6 DMSP								
2	091439Z	11.3N	88.3E	SAT	(IR DATA		)	NOAA-5	(CONF 02)							
3	100307Z	10.8N	86.3E	SAT	(T3.0/3.0 /		/ HRS)	NOAA-5	(CONF 01)							
4	101356Z	11.6N	84.8E	SAT	(IR DATA		)	NOAA-5	(CONF 02)							
5	101407Z	11.5N	85.2E	SAT	(IR DATA		)	PCN 6 DMSP								
6	101733Z	11.7N	84.7E	SAT	(IR DATA		)	PCN 6 DMSP								
7	110108Z	11.4N	82.7E	SAT	(T3.5/3.5 /		/ HRS)	PCN 4 DMSP								
8	110224Z	10.5N	82.5E	SAT	(T4.0/4.0 /D1.0/23HRS)			NOAA-5	(CONF 01)							
9	110615Z	10.9N	82.3E	SAT	(T3.0/3.5 /		/ HRS)	PCN 3 DMSP								
10	111358Z	11.0N	81.1E	SAT	(IR DATA		)	PCN 2 DMSP								
11	111507Z	11.0N	80.0E	SAT	(IR DATA		)	NOAA-5	(CONF 01)							
12	111857Z	11.2N	80.7E	SAT	(IR DATA		)	PCN 2 DMSP								
13	120051Z	11.0N	79.5E	SAT	(T3.0/3.5 /W0.5/24HRS)			PCN 2 DMSP								
14	120336Z	10.6N	80.0E	SAT	(T4.5/4.5 /D0.5/25HRS)			NOAA-5	(CONF 01)							
15	120558Z	10.7N	78.8E	SAT	(T3.0/3.5 /S /24HRS)			PCN 4 DMSP								
16	130215Z	10.5N	75.0E	SAT	(T1.5/2.5 /W1.5/25HRS)			PCN 6 DMSP								
17	131437Z	12.4N	74.0E	SAT	(IR DATA		)	PCN 6 DMSP								
18	131822Z	12.0N	73.0E	SAT	(IR DATA		)	PCN 6 DMSP								
19	140159Z	12.7N	72.0E	SAT	(T2.0/2.0 /D0.5/24HRS)			PCN 6 DMSP								
20	140406Z	12.6N	71.4E	SAT	(T2.0/2.0 /		/ HRS)	NOAA-5	(CONF 01)							
21	140704Z	12.7N	71.2E	SAT	(T3.0/3.0 /		/ HRS)	PCN 6 DMSP								
22	141441Z	12.7N	69.6E	SAT	(IR DATA		)	PCN 6 DMSP								
23	141453Z	13.3N	67.8E	SAT	(IR DATA		)	NOAA-5	(CONF 01)							
24	141946Z	13.2N	69.3E	SAT	(IR DATA		)	PCN 6 DMSP								
25	150141Z	13.9N	66.8E	SAT	(T3.5/3.5 /D1.5/24HRS)			PCN 6 DMSP								
26	150320Z	13.9N	67.8E	SAT	(T4.0/4.0 /D2.0/23HRS)			NOAA-5	(CONF 01)							
27	150646Z	14.4N	66.7E	SAT	(T4.0/3.5 /D1.0/24HRS)			PCN 4 DMSP								
28	151423Z	14.3N	66.4E	SAT	(IR DATA		)	PCN 6 DMSP								
29	151607Z	13.5N	65.6E	SAT	(IR DATA		)	NOAA-5	(CONF 01)							
30	151928Z	14.0N	66.4E	SAT	(IR DATA		)	PCN 6 DMSP								
31	160305Z	13.7N	66.5E	SAT	(T4.0/4.0 /D0.5/25HRS)			PCN 6 DMSP								
32	160433Z	13.0N	66.8E	SAT	(T4.5/4.5 /D0.5/25HRS)			NOAA-5	(CONF 01)							
33	160624Z	13.4N	66.6E	SAT	(T4.0/4.0 /S /24HRS)			PCN 4 DMSP								
34	161521Z	13.0N	64.5E	SAT	(IR DATA		)	NOAA-5	(CONF 01)							
35	161911Z	13.5N	67.0E	SAT	(IR DATA		)	PCN 6 DMSP								
36	170248Z	12.2N	67.2E	SAT	(T4.5/4.5 /D0.5/24HRS)			PCN 6 DMSP								
37	170349Z	13.1N	66.9E	SAT	(T5.0/5.0 /D0.5/23HRS)			NOAA-5	(CONF 01)							
38	170611Z	12.1N	66.8E	SAT	(IR DATA		)	PCN 6 DMSP								
39	171432Z	12.5N	67.3E	SAT	(IR DATA		)	NOAA-5	(CONF 01)							
40	171530Z	12.0N	67.0E	SAT	(IR DATA		)	PCN 6 DMSP								
41	171853Z	12.4N	66.6E	SAT	(IR DATA		)	PCN 4 DMSP								
42	180231Z	11.7N	67.3E	SAT	(T3.5/4.5 /W1.0/24HRS)			PCN 6 DMSP								
43	180502Z	10.4N	67.4E	SAT	(T5.0/5.0 /S /25HRS)			NOAA-5	(CONF 01)							
44	180735Z	11.4N	67.5E	SAT	(IR DATA		)	PCN 6 DMSP								
45	181514Z	10.6N	69.4E	SAT	(IR DATA		)	PCN 6 DMSP								
46	181549Z	10.3N	69.0E	SAT	(IR DATA		)	NOAA-5	(CONF 01)							
47	181836Z	10.3N	70.2E	SAT	(IR DATA		)	PCN 6 DMSP								
48	190214Z	10.3N	70.2E	SAT	(T3.5/3.5 /S /24HRS)			PCN 6 DMSP								
49	190418Z	10.3N	69.6E	SAT	(T3.0/4.0 /W2.0/23HRS)			NOAA-5	(CONF 01)							
50	190717Z	10.0N	70.5E	SAT	(IR DATA		)	PCN 6 DMSP								
51	191456Z	9.8N	70.3E	SAT	(IR DATA		)	PCN 6 DMSP								
52	191818Z	9.7N	70.5E	SAT	(IR DATA		)	PCN 6 DMSP								
53	200157Z	10.3N	71.4E	SAT	(T3.5/3.5 /S /24HRS)			PCN 6 DMSP								
54	200335Z	10.2N	72.8E	SAT	(T3.5/4.0 /D0.5/23HRS)			NOAA-5	(CONF 01)							
55	200700Z	10.8N	71.9E	SAT	(IR DATA		)	PCN 6 DMSP								
56	201439Z	10.0N	74.0E	SAT	(IR DATA		)	PCN 6 DMSP								
57	201800Z	9.8N	73.2E	SAT	(IR DATA		)	PCN 6 DMSP								
58	210140Z	10.5N	73.6E	SAT	(T3.5/3.5 /S /24HRS)			PCN 4 DMSP								
59	210642Z	11.6N	73.4E	SAT	(IR DATA		)	PCN 5 DMSP								
60	211422Z	13.2N	73.5E	SAT	(IR DATA		)	PCN 6 DMSP								
61	211554Z	14.9N	73.4E	SAT	(IR DATA		)	NOAA-5	(CONF 01)							
62	211926Z	15.2N	74.1E	SAT	(IR DATA		)	PCN 6 DMSP								
63	220123Z	15.1N	74.4E	SAT	(T2.5/3.0 /W1.0/24HRS)			PCN 6 DMSP								
64	220401Z	15.9N	75.0E	SAT	(T1.0/1.5 /		/ HRS)	NOAA-5	(CONF 01)							
65	220624Z	16.7N	74.6E	SAT	(IR DATA		)	PCN 6 DMSP								
66	221405Z	17.5N	74.6E	SAT	(IR DATA		)	PCN 6 DMSP								

FIX POSITIONS FOR TROPICAL CYCLONE NO. 22-77
0800Z 15 NOV TO 2000Z 19 NOV

FIX NO.	TIME	POSIT		FIX CAT	ACCRY NAV-MET / FIX LVL / MAX OBS FLT LVL WIND DIR VEL BRG RNG	MAX OBS SFC WIND VEL BRG RNG		OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	POSIT OF RADAR	MSN NMBR
1	140016Z	6.1N	91.6E	SAT	(T1.5/1.5 / / HRS)	PCN 6	DMSP								
2	140210Z	5.9N	91.7E	SAT	(T1.5/1.5 / / HRS)		NOAA-5	(CONF 01)							
3	140525Z	5.9N	91.0E	SAT	(T2.5/2.5 / / HRS)	PCN 6	DMSP								
4	141451Z	6.5N	91.2E	SAT	(IR DATA)		NOAA-5	(CONF 01)							
5	141906Z	6.0N	90.0E	SAT	(IR DATA)	PCN 4	DMSP								
6	150141Z	6.1N	89.3E	SAT	(T3.0/3.0 /D1.5/25HRS)	PCN 6	DMSP								
7	150323Z	6.7N	89.8E	SAT	(T3.0/3.0 /D1.5/25HRS)		NOAA-5	(CONF 01)							
8	150505Z	6.0N	87.5E	SAT	(T4.0/4.0 /D1.5/24HRS)	PCN 4	DMSP								
9	151241Z	6.2N	85.9E	SAT	(IR DATA)	PCN 4	DMSP								
10	151407Z	6.1N	86.3E	SAT	(IR DATA)		NOAA-5	(CONF 02)							
11	151747Z	6.4N	86.0E	SAT	(IR DATA)	PCN 6	DMSP								
12	160124Z	7.0N	85.6E	SAT	(T4.5/4.5 /D1.5/24HRS)	PCN 6	DMSP								
13	160239Z	6.8N	85.5E	SAT	(T5.0/5.0 /D2.0/23HRS)		NOAA-5	(CONF 01)							
14	160620Z	7.0N	85.4E	SAT	(T5.5/5.5 /D1.5/25HRS)	PCN 2	DMSP								
15	161406Z	8.2N	84.9E	SAT	(IR DATA)	PCN 2	DMSP								
16	161523Z	8.0N	84.2E	SAT	(IR DATA)		NOAA-5	(CONF 01)							
17	161729Z	8.7N	84.5E	SAT	(IR DATA)	PCN 2	DMSP								
18	170107Z	9.6N	84.5E	SAT	(T5.5/5.5 /D1.0/24HRS)	PCN 2	DMSP								
19	170350Z	9.1N	83.7E	SAT	(T5.5/5.5 /D0.5/25HRS)		NOAA-5	(CONF 01)							
20	170611Z	10.2N	83.9E	SAT	(IR DATA)	PCN 2	DMSP								
21	171329Z	11.4N	83.3E	SAT	(IR DATA)	PCN 2	DMSP								
22	171437Z	11.4N	83.7E	SAT	(IR DATA)		NOAA-5	(CONF 01)							
23	171853Z	11.7N	83.1E	SAT	(IR DATA)	PCN 2	DMSP								
24	180050Z	12.3N	82.7E	SAT	(T6.0/6.0 /D0.5/24HRS)	PCN 2	DMSP								
25	180335Z	12.5N	82.9E	SAT	(T7.0/7.0 /D1.5/23HRS)		NOAA-5	(CONF 01)							
26	180553Z	12.6N	82.5E	SAT	(IR DATA)	PCN 2	DMSP								
27	181551Z	13.5N	81.9E	SAT	(IR DATA)		NOAA-5	(CONF 01)							
28	181834Z	13.8N	81.7E	SAT	(IR DATA)	PCN 2	DMSP								
29	190032Z	14.5N	81.6E	SAT	(IR DATA)	PCN 2	DMSP								
30	190214Z	14.8N	81.6E	SAT	(T6.0/6.0 /S /25HRS)	PCN 2	DMSP								
31	190416Z	15.1N	81.9E	SAT	(T7.0/7.0 /S /25HRS)		NOAA-5	(CONF 01)							
32	190536Z	15.2N	81.3E	SAT	(IR DATA)	PCN 2	DMSP								
33	191314Z	16.1N	80.0E	SAT	(IR DATA)	PCN 2	DMSP								
34	191818Z	16.9N	80.8E	SAT	(IR DATA)	PCN 2	DMSP								
35	200157Z	18.2N	81.2E	SAT	(T4.0/5.0 /W2.0/24HRS)	PCN 6	DMSP								
36	200514Z	19.2N	81.9E	SAT	(IR DATA)	PCN 6	DMSP								
37	201800Z	19.5N	80.8E	SAT	(IR DATA)	PCN 6	DMSP								

LATE FIXES LISTED AS [ ] IN TABLE 6-1.

TYPHOON BABE - 0000Z 02 SEP TO 1800Z 10 SEP

```
01  060020Z  13.0N 130.0E  SAT   (T4.0/4.0 /S   /24HRS)        NOAA-5   (CONF 01)
02  061109Z  14.0N 129.2E  SAT   (IR DATA               )        NOAA-5   (CONF 03)
03  081141Z  22.0N 127.0E  SAT   (IR DATA               )        NOAA-5   (CONF 01)
```

TROPICAL STORM CARLA - 0000Z 03 SEP TO 0000Z 05 SEP

```
01  020118Z  18.3N 118.0E  SAT   (T1.5/1.5 /D1.0/24HRS)        NOAA-5   (CONF 02)
```

TYPHOON DINAH - 1200Z 14 SEP TO 1800Z 23 SEP

```
01  122303Z  (SEE COMMENT) SAT   (T2.0/2.0 /S   /24HRS)        NOAA-5   (CONF 01) - 02 DEG EITHER SIDE OF A LINE FM 22N-135E
                                                                                   TO 22N-142E
02  131157Z  22.7N 134.3E  SAT   (IR DATA               )        NOAA-5   (CONF 01)
03  140015Z  22.0N 131.5E  SAT   (T3.0/3.0 /D1.0/25HRS)        NOAA-5   (CONF 01)
04  141110Z  21.6N 128.0E  SAT   (IR DATA               )        NOAA-5   (CONF 02)
```

TROPICAL STORM EMMA - 0600Z 15 SEP TO 0600Z 20 SEP

```
01  141108Z  19.0N 144.5E  SAT   (IR DATA               )        NOAA-5   (CONF 02)
```

TROPICAL STORM FREDA - 0000Z 23 SEP TO 0000Z 25 SEP

```
01  241330Z  20.4N 111.0E  SAT   (IR DATA               )        NOAA-5   (CONF 02)
```

TYPHOON GILDA - 0000Z 03 OCT TO 0600Z 10 OCT

```
01  042227Z  19.2N 152.7E  SAT   (T3.5/3.5 /D1.0/23HRS)        NOAA-5   (CONF 02)
02  052315Z  23.5N 150.0E  SAT   (T4.0/4.0 /D0.5/25HRS)        NOAA-5   (CONF 01)
03  070027Z  26.5N 147.8E  SAT   (T4.5/4.5 /D0.5/24HRS)        NOAA-5   (CONF 01)
04  080004Z  30.0N 147.7E  SAT   (T5.0/5.0 /D0.5/24HRS)        NOAA-5   (CONF 01)
05  091024Z  41.2N 165.4E  SAT   (IR DATA               )        NOAA-5   (CONF 01)
```

TROPICAL STORM HARRIET - 0600Z 16 OCT TO 1800Z 20 OCT

```
01  160006Z  15.1N 136.1E  SAT   (T2.0/2.0 /D2.0/24HRS)        NOAA-5   (CONF 01)
02  170117Z  17.1N 131.9E  SAT   (T3.0/3.0 /D1.0/25HRS)        NOAA-5   (CONF 01)
03  180034Z  18.9N 132.5E  SAT   (T3.5/3.5 /D0.5/23HRS)        NOAA-5   (CONF 02)
04  181126Z  19.5N 133.3E  SAT   (IR DATA               )        NOAA-5   (CONF 02)
```

TYPHOON IVY - 0600Z 21 OCT TO 0000Z 27 OCT

```
01  240000Z  21.2N 151.1E  SAT   (T4.5/4.5 /D0.5/25HRS)        NOAA-5   (CONF 01)
```

TYPHOON JEAN - 1200Z 28 OCT TO 1200Z 03 NOV

```
01  012313Z  26.7N 146.1E  SAT   (T3.0/3.0 /D1.0/23HRS)        NOAA-5   (CONF 01)
```

TYPHOON KIM - 0600Z 06 NOV TO 0000Z 17 NOV

```
01  071018Z  12.3N 149.0E  SAT   (IR DATA               )        NOAA-5   (CONF 01)
02  131145Z  14.3N 123.2E  SAT   (IR DATA               )        NOAA-5   (CONF 01)
03  150122Z  16.9N 118.8E  SAT   (T3.5/3.5 /W1.5/25HRS)        NOAA-5   (CONF 01)
```

TYPHOON LUCY - 0600Z 28 NOV TO 1800Z 07 DEC

```
01  281025Z  06.9N 157.0E  SAT   (IR DATA               )        NOAA-5   (CONF 02)
```

TYPHOON MARY - 0600Z 20 DEC TO 1800Z 03 JAN

```
01  232159Z  12.6N 170.5E  SAT   (T3.5/4.5 /W1.0/25HRS)        NOAA-5   (CONF 01)
02  260918Z  09.5N 165.0E  SAT   (IR DATA               )        NOAA-5   (CONF 01)
03  290011Z  11.4N 149.5E  SAT   (T3.5/3.5 /S   /25HRS)        NOAA-5   (CONF 01)
04  291059Z  11.1N 145.5E  SAT   (IR DATA               )        NOAA-5   (CONF 01)
05  292328Z  11.1N 143.0E  SAT   (VIS DATA              )        NOAA-5   (CONF 01)
06  311127Z  09.4N 134.6E  SAT   (IR DATA               )        NOAA-5   (CONF 02)
07  030025Z  09.9N 122.3E  SAT   (T1.5/1.5 /W1.0/24HRS)        NOAA-5   (CONF 01)
```

LATE FIXES LISTED AS [ ] IN TABLE 6-1.

TROPICAL CYCLONE NO. 21-77 - 2000Z 10 NOV TO 2000Z 21 NOV

```
01  191505Z  09.4N 070.0E  SAT   (IR DATA              )       NOAA-5   (CONF 01)
02  201618Z  10.0N 072.9E  SAT   (IR DATA              )       NOAA-5   (CONF 02)
03  210445Z  11.2N 074.8E  SAT   (T2.5/3.0 /W1.0/25HRS)        NOAA-5   (CONF 02)
```

TROPICAL CYCLONE NO. 22-77 - 0800Z 15 NOV TO 2000Z 19 NOV

```
01  191507Z  15.9N 080.9E  SAT   (IR DATA              )       NOAA-5   (CONF 01)
02  200331Z  19.6N 082.2E  SAT   (VIS DATA             )       NOAA-5   (CONF 02)
```

APPENDIX

1. CONTRACTIONS

AC&W	Aircraft Control and Warning System
ACCRY	Accuracy
ACFT	Aircraft
ACR	Aircraft Radar
AIREP	Aircraft Weather Report(s) (Commercial and Military)
ANT	Antenna
ARWO	Airborne Weather Reconnaissance Officer
ATT	Attenuation
AVG	Average
AWN	Automated Weather Network
BRG	Bearing
CAT	Category
CIRC	Circular
CLD	Cloud
CLSD	Closed
CNTR	Center
CONC	Concentric
CONF	Confidence (number)
DEG	Degree(s)
D/DIA	Diameter
DIR	Direction
DMSP	Defense Meteorological Satellite Program
ELEV	Elevation
ELIP	Elliptical
FLT	Flight
GOES	Goestationary Operational Environmental Satellite
HATRACK	Hurricane and Typhoon Tracking (numerical forecast)
HGT	Height
HPAC	Mean of XTRP and Climatology
HUR	Hurricane
HR(S)	Hour(s)
HVY	Heavy
IR	Infrared
KM	Kilometer(s)
KT	Knot(s)
LRDR	Land Radar
LVL	Level
M/SEC	Meters per Second
MAX	Maximum
MB	Millibar(s)
MET	Meteorological
MH50	MOHATT 500 mb Prog
MH70	MOHATT 700 mb Prog
MIN	Minimum
MOHATT	Modified Hatrack
MSN	Mission
NAV	Navigational
NEDN	Naval Environmental Data Network
NEDS	Naval Environmental Display Station
NET	Near Equatorial Trough
NM	Nautical Mile(s)
OBS	Observation
P	Penetration (by aircraft)
PC	Percent (%)
PCN	Position Code Number
PSBL	Possible
PTLY	Partly
QUAD	Quadrant
RECON	Reconnaissance
RNG	Range
RPD	Rapid
SAT	Satellite
SFC	Surface
SLP (MSLP)	Sea Level Pressure (Minimum Sea Level Pressure)
SMS	Synchronous Meteorological Satellite
SPOL	Spiral Overlay
SRDR	Ship Radar

SRP	Selective Reconnaissance Program
STNRY	Stationary
STY	Super Typhoon
TC	Tropical Cyclone
TCARC	Tropical Cyclone Aircraft Reconnaissance Coordinator
TCM	Tropical Cyclone Model
TD	Tropical Depression
TI	Temperature Inside Eye
TO	Temperature Outside Eye
TS	Tropical Storm
TY	Typhoon
TUTT	Tropical Upper Tropospheric Trough
VEL	Velocity
VIS	Visual
VSBL	Visible
WESTPAC	Western Pacific
WMO	World Meteorological Organization
WRS	Weather Reconnaissance Squadron
XTRP	Extrapolation
Z	Zulu Time (Greenwich mean time)

2. DEFINITIONS

BEST TRACK-A subjectively smoothed path, versus a precise and very erratic fix-to-fix path, used to represent tropical cyclone movement.

CYCLONE-A closed atmospheric circulation rotating about an area of low pressure (counterclockwise in the northern hemisphere).

EPHEMERIS-Position of a body (satellite) in space as a function of time. When no geographical reference is available for gridding satellite imagery, then only ephemeris gridding is possible which is solely based on the theoretical satellite position and is susceptible to errors from satellite pitch, orbit eccentricity and the non-spherical earth.

EXTRATROPICAL-A term used in warnings and tropical summaries to indicate that a cyclone has lost its "tropical characteristics". The term implies both poleward displacement from the tropics and the conversion of the cyclone's primary energy sources from release of latent heat of condensation to baroclinic processes. The term carries no implications as to strength or size.

EYE/CENTER-Refers to the roughly circular central area of a well developed tropical cyclone usually characterized by comparatively light winds and fair weather. If more than half surrounded by wall cloud, the word "eye" is used, otherwise the area is referred to as a center.

MAXIMUM SUSTAINED WIND-Maximum surface wind speed averaged over a 1-minute period of time. Peak gusts over water average 20 to 25 percent higher than sustained wind.

RECURVATURE-The turning of a tropical storm from an initial path toward the west or northwest to the north or northeast.

SIGNIFICANT TROPICAL CYCLONE-A tropical cyclone becomes "significant" with the issuance of the first numbered warning by the responsible warning agency.

SUPER TYPHOON/HURRICANE-A typhoon/hurricane in which the maximum sustained surface wind (1-minute mean) is 130 kt or greater.

TROPICAL CYCLONE-A nonfrontal low pressure system of synoptic scale developing over tropical or subtropical waters and having a definite organized circulation.

TROPICAL CYCLONE AIRCRAFT RECONNAISSANCE COORDINATOR-A CINCPACAF representative designated to levy tropical cyclone aircraft weather reconnaissance requirements on reconnaissance units within a designated area of the PACOM and to function as coordinator between CINCPACAF, aircraft weather reconnaissance units, and the appropriate typhoon/hurricane warning center.

TROPICAL DEPRESSION-A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 33 kt or less.

TROPICAL DISTURBANCE-A discrete system of apparently organized convection--generally 100 to 300 miles in diameter--originating in the tropics or subtropics, having a nonfrontal migratory character, and having maintained its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field. As such, it is the basic generic designation which, in successive stages of intensification, may be classified as a tropical depression, tropical storm or typhoon.

TROPICAL STORM-A tropical cyclone with maximum sustained surface winds (1-minute mean) in the range of 34 to 63 kt, inclusive.

TROPICAL UPPER TROPOSPHERIC TROUGH (TUTT)-"A dominant climatological system, and a daily synoptic feature, of the summer season over the tropical North Atlantic, North Pacific and South Pacific Oceans," from Sadler, James C., Feb. 1976: Tropical Cyclone Initiation by the Tropical Upper Tropospheric Trough. (NAVENVPREDRSCHFAC Technical Paper No. 2-76)

TYPHOON/HURRICANE-A tropical cyclone in which the maximum sustained surface wind (1-minute mean) is 64 kt or greater.

WALL CLOUD-An organized band of cumuliform clouds immediately surrounding the central area of tropical cyclone. Wall clouds may entirely enclose the eye or only partially surround the center.

DISTRIBUTION

AFGWC (2)
AFGL/LYU (2)
AMER EMBASSY, BANGKOK (7)
ANDREWS UNIV (1)
ARIZONA STATE UNIV (1)
ARRS/CC (4)
AWS/DNT/DOR (5)
BUR OF MET, BRISBANE (2)
BUR OF MET, MELBOURNE (1)
BUR OF MET, PERTH (1)
CATH UNIV OF AMER (2)
CENWEABUR TAIWAN (3)
CHIEF, MAAG TAIWAN (1)
CHINESE AF WEACEN TAIWAN (3)
CINCPAC (2)
CINCPACAF/DOW (1)
CINCPACFLT (5)
CIVIL DEFENSE (GUAM) (4)
CNO (2)
COLORADO STATE UNIV (2)
COLORADO STATE UNIV (LIBR) (1)
COMATKCARSTKFORSEVENTHFLT (2)
COMFAIRECONRON ONE (VQ-1) (3)
COMLOGSUPFORSEVENTHFLT (1)
COMNAVAIRSYSCOM (2)
COMNAVFACENGCOMPACDIV (1)
COMNAVFORJAPAN (1)
COMNAVMARIANAS (1)
COMNAVSURFPAC (2)
COMPATRECONFORSEVENTHFLT (1)
COMPATWING (1)
COMPHIBGRU (1)
COMSC (1)
COMSEVENTHFLT (2)
COMSUBGRU SEVEN (2)
COMSUBPAC (1)
COMTHIRDFLT (1)
COMUSNAVPIL (3)
COMUSTDC (1)
DDC (12)
DEPT AIR FORCE (1)
DET 2, 1WW (2)
DET 4, HQ AWS (MAC) (5)
DET 5, 1WW (3)
DET 8, 30WS (2)
DET 10, 30WS (1)
DET 15, 30WS (1)
DET 17, 30WS (1)
DET 18, 30WS (1)
DIRNAVOCEANMET (10)
DISTAD MARSHALLS (5)
DMA (1)
ENVSCISUPGRU (5)
ESCAP (2)
FAA (GUAM) (5)
FLENUMWEACEN (2)
FLEWEACEN NORFOLK (1)
FLEWEACEN PEARL HARBOR (2)
FLEWEACEN ROTA (1)
FLEWEAFAC SUITLAND (2)
FLORIDA STATE UNIV (2)
GEN MET DEPT THAILAND (2)
GOVERNOR OF GUAM (2)
GUAM PUBLIC LIBRARY (1)
HEDSUPPACT (2)
ICY AWS/DOR (5)
INDIA MET DEPT (2)
JAPAN MET AGENCY (3)
LIBR OF CONGRESS (1)
LIBR OF CONGRESS (EXCHANGE & GIFT DIV) (4)
LOS ANGELES PUBLIC LIBR (1)
MAC/HO (2)
MCAS FUTEMA (1)
MCAS IWAKUNI (2)
MCAS KANEOHE BAY (1)
MET DEPT BANGKOK (2)
MET RESEARCH INSTITUTE LIBR (3)
NASA GREENBELT (3)
NASA WALLOPS ISLAND (1)
NAT CLIM CNTR (1)
NATWEASERV FOROFF HONOLULU (1)
NATWEASERV PACREG (2)
NAVAL ACADEMY (1)
NAVWEASERVFAC ALAMEDA (1)
NAVWEASERFAC JACKSONVILLE (1)
NAVWEASERVFAC YOKOSUKA (1)
NAVENVPREDRESFAC (5)
NESS/SFSS (2)
NHC, NOAA (1)
NOAA/EDS CORAL GABLES (4)
NOAA/EDS WASHINGTON, DC (2)
NOAA/ERL BOULDER (2)
NOAA/ERL MIAMI (1)
NOAA/HYDROLOGY BR (1)
NOAA/LIBRARY (1)
NOAA/NESS (2)
NOAA/PMEL (1)
NPGS DEPT OF MET (3)
NPGS LIBR (1)
NWESA (1)
NWSD ASHEVILLE (2)
NWSED AGANA (2)
NWSED ATSUGI (1)
NWSED BARBERS POINT (1)
NWSED CUBI POINT (1)
NWSED KADENA (4)
NWSED MISAWA (1)
OCEANOGRAPHER OF THE NAVY (3)
ODDR & E (2)
OKINAWA MET OBS (1)
OLG/HQ AWS (1)
PAGASA (6)
ROYAL OBSERVATORY HONG KONG (3)
TAIWAN UNIV (3)
TEXAS A&M UNIV (1)
TTPI (8)
TYPHOON COMM SECR (1)
UNIV OF CHICAGO (1)
UNIV OF GUAM (2)
UNIV OF HAWAII DEPT OF MET (3)
UNIV OF HAWAII LIBR (1)
UNIV OF MEXICO (1)
UNIV OF RP (2)
UNIV OF WASHINGTON (1)
USAFSAAS/TMWF (2)
USDOC/NOAA (1)
USS BLUE RIDGE (LCC 19) (1)
USS CONSTELLATION (CV 64) (2)
USS CORAL SEA (CV 43) (1)
USS ENTERPRISE (CVN 65) (1)
USS KITTY HAWK (CV 63) (1)
USS LONG BEACH (CGN 9) (2)
USS MIDWAY (CV 41) (2)
USS NEW ORLEANS (LPH 11) (2)
USS OKINAWA (LPH 3) (1)
USS OKLAHOMA CITY (CG 5) (1)
USS RANGER (CV 61) (2)
USS TARAWA (LHA 1) (1)
USS TRIPOLI (LPH 10) (1)
WEA SERV MET OBS (2)
1WW/DON (6)
3AD/DOX (1)
3WW/DNC (1)
5WW/DNC (1)
30WSQ (6)
41RWRW (2)
43SW/OI (2)
53WRS (1)
54WRS (5)
3350TTW (1)
3360TCHTG (1)

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Annual Typhoon Report 1977	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) 6 ANNUAL TYPHOON REPORT 1977.		5. TYPE OF REPORT & PERIOD COVERED Annual (JAN-DEC 1977) 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) 10 Dean R. Morford James K. Lavin		8. CONTRACT OR GRANT NUMBER(s) 9 Rept. for Jan-Dec 77,
9. PERFORMING ORGANIZATION NAME AND ADDRESS FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER (FLEWEACEN/JTWC), GUAM FPO SAN FRANCISCO 96630		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS FLEET WEATHER CENTRAL/JOINT TYPHOON WARNING CENTER (FLEWEACEN/JTWC), GUAM FPO SAN FRANCISCO 96630		11 12. REPORT DATE 1977 13. NUMBER OF PAGES 123 12 136p.
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Tropical cyclones	Tropical storms
Tropical cyclone forecasting	Tropical depressions
Tropical cyclone research	Typhoons
Tropical cyclone steering model	Meteorological satellite
Tropical cyclone fix data	Aircraft reconnaissance

ABSTRACT

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Annual publication summarizing the tropical cyclone season in the western North Pacific, Bay of Bengal, and the central North Pacific. A brief narrative is given on each typhoon in the western North Pacific including the best track. Pertinent reconnaissance data used to construct the best tracks are provided. Forecast verification data and statistics for the JTWC are summarized. Research efforts at the JTWC is discussed briefly.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

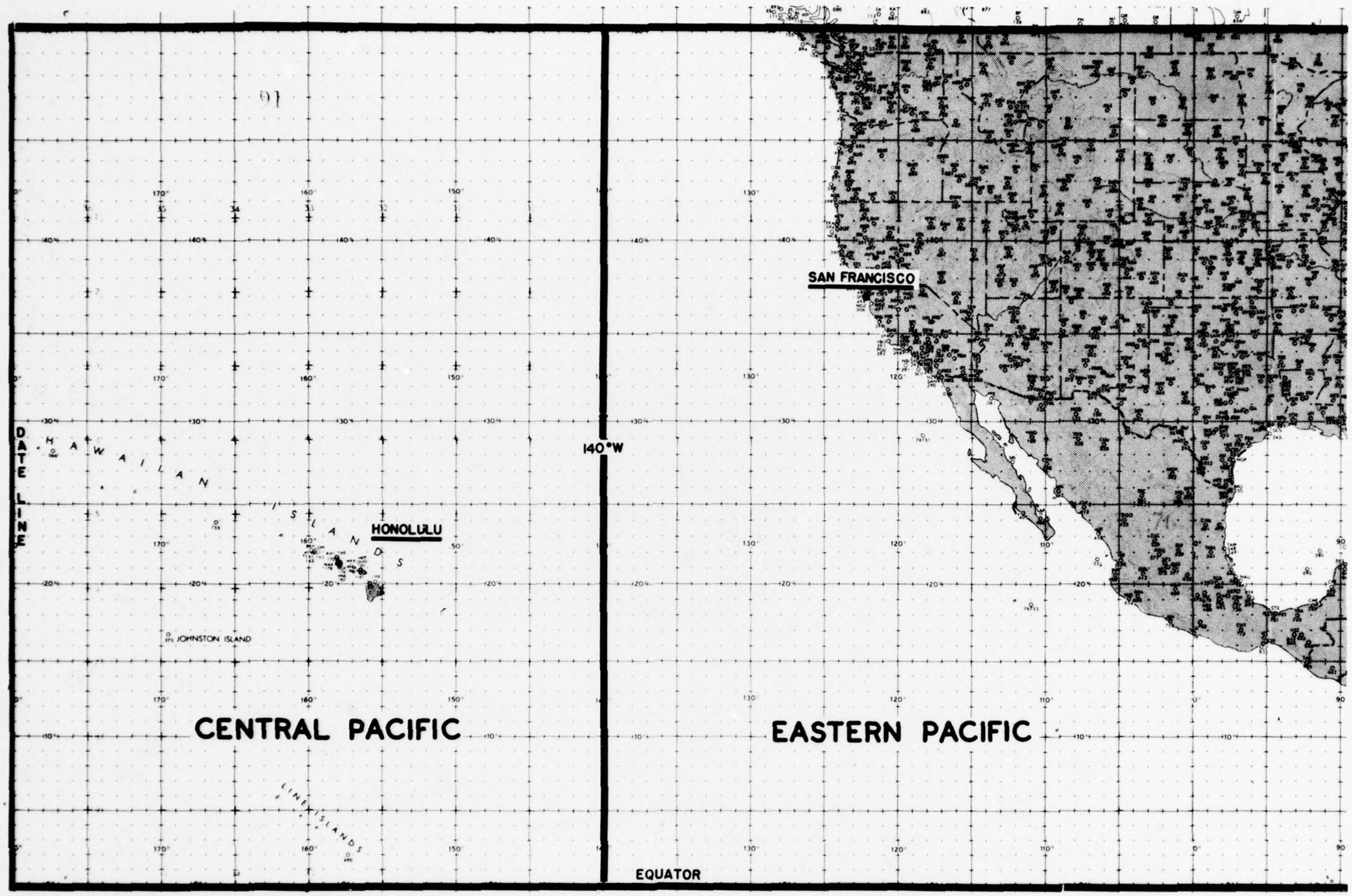
Unclassified ABSTRACT

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

408282

CL

19. Naval environmental display station



Areas of Responsibility - Central and Eastern Pacific Hurricane Centers